VOLUME 50 NUMBER 4

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CONTENTS OF PREVIOUS NUMBER

SEPTEMBER 1949. NUMBER 3

Chorda Tympani Nerve Graft: II. Report of Follow-Up Observations One Year Postoperatively. Samuel Rosen, M.D., New York.

The Hearing Aid in Mixed Deafness. Maurice Saltzman, M.D., and Matthew S. Ersner, M.D., Philadelphia.

Streptomycin Toxicity of the Eighth Nerve. Donald J. Peik, M.D., and Howard High Jr., M.D., Waukesha, Wis., and Paul A. Campbell, M.D., Chicago.

A New Treatment of Acute Aero-Otitis Media. Barnard C. Trowbridge, M.D., Sc.D., Kansas City, Mo.

Contact Ulcers and Laryngeal Tuberculosis. Henrik Johansen, M.D., and William Kiaer, M.D., Copenhagen, Denmark.

Bacitracin: Its Topical Use in Aural and Pharyngeal Infections. James E. Coyle, M.D.; Katherine Collins, B.A., and Walter J. Nungester, M.D., Ann Arbor, Mich.

Tribromoethanol-Ether Anesthesia Used for Tonsillectomy and Adenoidectomy: An Analysis of 3,042 Cases over an Eight Year Period. Starling C. Yinger, M.D., Springfield, Ohio.

Use of Thiopental Sodium U. S. P. (Sodium Pentothal®) in Operations on Ear, Nose and Throat. Gilbert E. Fisher, M.D., and Lawrence S. Woodley, M.D., Birmingham, Ala.

Radium and the Lymphoid Tissue of the Nasopharynx and Pharynx: A New Universal Applicator. Wallace Morrison, M.D., New York.

Primary Amyloid Deposits in the Larynx. L. J. Kreissl, M.D.; E. E. Muirhead, M.D., and L. E. Darrough, M.D., Dallas, Texas.

Monostotic Fibrous Dysplasia: Report of Two Cases. Colonel S. L. Cooke, Medical Corps, United States Army, and W. H. Powers, M.D., Oak Park, Ill.

Case Reports:

Rhabdomyosarcoma of the Middle Ear. Lieutenant Commander Safa Karatay, Turkish Navy, Istanbul, Turkey.

Progress in Otolaryngology. Summaries of the Bibliographic Material Available in the Field of Otolaryngology:

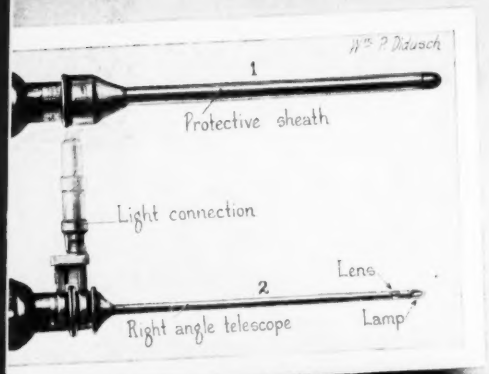
Functional Examination of Hearing. Alfred Lewy, M.D.; Sherman L. Shapiro, M.D., and Norman Leshin, M.D., Chicago.

Abstracts from Current Literature.

News and Comment.

Book Reviews.

Directory of Otolaryngologic Societies.



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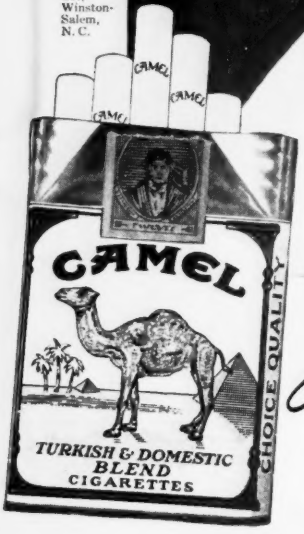

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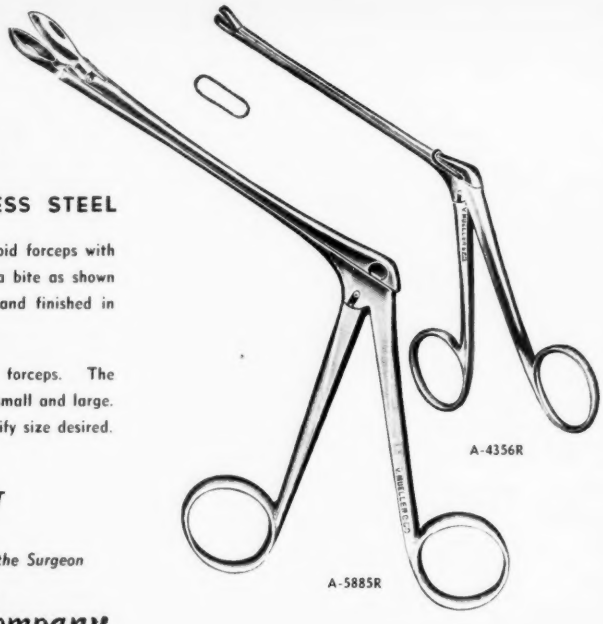

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1. **PERSKY, A. H.**: "Penicillin-Vasoconstrictor Treatment of Post-Influenzal Rhinitis and Sequellae", Medical Record, November, 1947.

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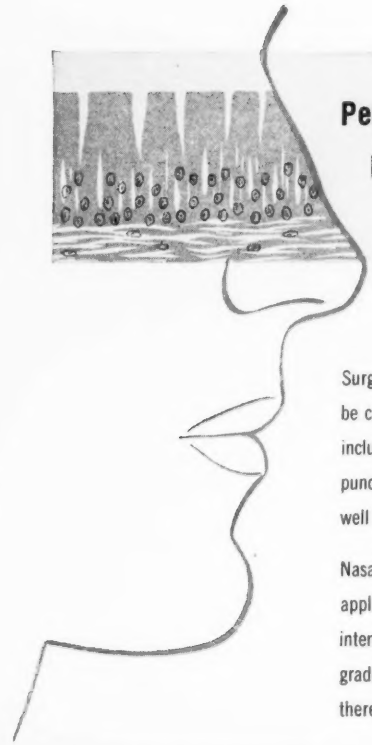

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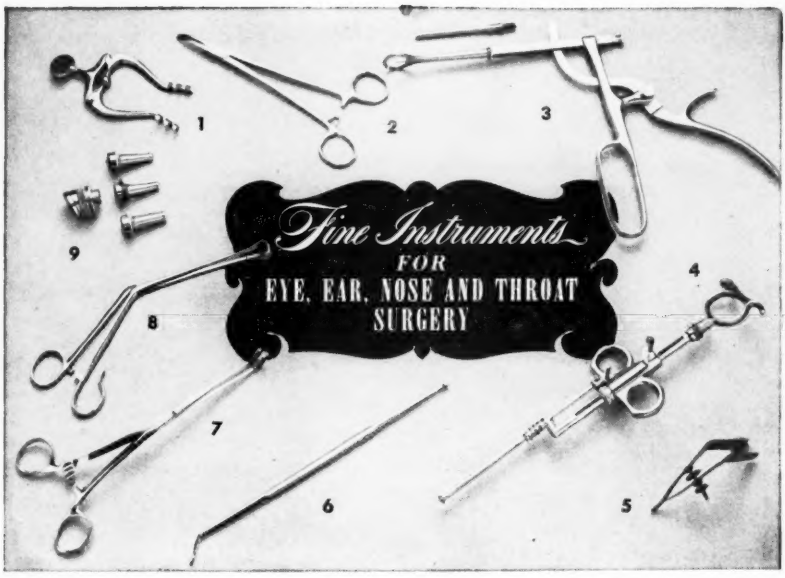

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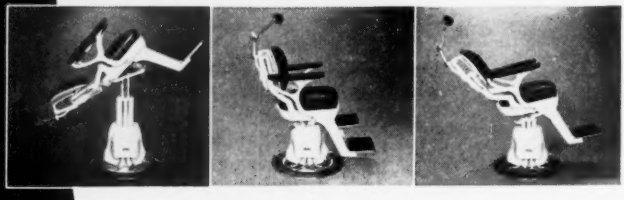

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VOLUME 50 OCTOBER 1949 NUMBER 4

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SURGERY AT THE BASE OF THE TONGUE BY TRANSPHARYNGEAL APPROACH

PROFESSOR GEORGES PORTMANN
BORDEAUX, FRANCE

THE SECURITY today which is due to the new method of total laryngectomy permits considering enlargement of the surgical field toward the esophagus and the trachea as well as toward the pharynx and the base of the tongue. Particularly surgery at the base of the tongue has remained of extreme seriousness, and one hesitates even when such a procedure seems the logical therapeutic measure. Especially is this so when one contemplates an external approach.

With laryngectomy one has an extremely easy route to the hypopharynx and the laryngopharynx. When the larynx has been removed and the head is hyperextended, the oropharynx may be inspected, and the base of the tongue and the glossoepiglottic groove and tonsils are brought into view. The tongue may thus be easily approached.

TECHNIC

After the larynx has been removed, the body of the hyoid bone is removed. Then, with Museux forceps, the base of the tongue is grasped and pulled out of the operative opening. The resection of the muscular layers involved is made with strong scissors or the knife. When the resection is made, a strong silk suture is placed in the section of the tongue and the operation is finished by a pharyngostomy, as in the classic laryngectomy.

Of course, the principal indication for the operation is tumor of the epiglottic region and the base of the tongue, but, in addition to its use in cases of laryngeal involvement, the translaryngeal approach may be employed when the tumor is located at the base of the tongue with or without involvement of the glossotonsillar grooves and the inferior poles of the tonsils.

Because with tumors of the first type the epiglottis is invaded and the tumor extends more or less into the laryngeal vestibule, the classic total laryngectomy is necessary; with the second type, on the contrary, I modify the technic by limiting the operation to the upper part of the larynx, even maintaining in some cases the integrity of the vocal cords and the arytenoid cartilages.

The time for surgical intervention is after (1) previous substernal tracheotomy or (2) pharyngolaryngectomy. The procedure, which differs from the classic laryngectomy, is carried out in the following steps:

First Step.—Incision in an arc, comprising a transverse curvilinear incision in the inferior concavity, passing about 1 cm. over the hyoid bone, and a vertical incision down the superior surface of the cricoid cartilage. The cutaneous layers are retracted on each side and held with forceps.

Second Step.—Section of the subhyoid muscles close to the hyoid bone and of the laryngeal skeleton on its lateral aspect at the level of the thyroid cartilage.

Third Step.—An oblique section from front to rear and upward to the thyroid cartilage, made by passing from the middle of its anterior angle. The Liston forceps is used, and the incision is begun transversely, by opening the thyroid cartilage a few millimeters under its concavity. The larynx being opened, a strong scissors for the oblique section of the alae of the thyroid cartilage is helpful.

This section, which opens the laryngeal vestibule above the vocal cords, exposes the posterior part of the aryepiglottic folds. The anterior fragment of

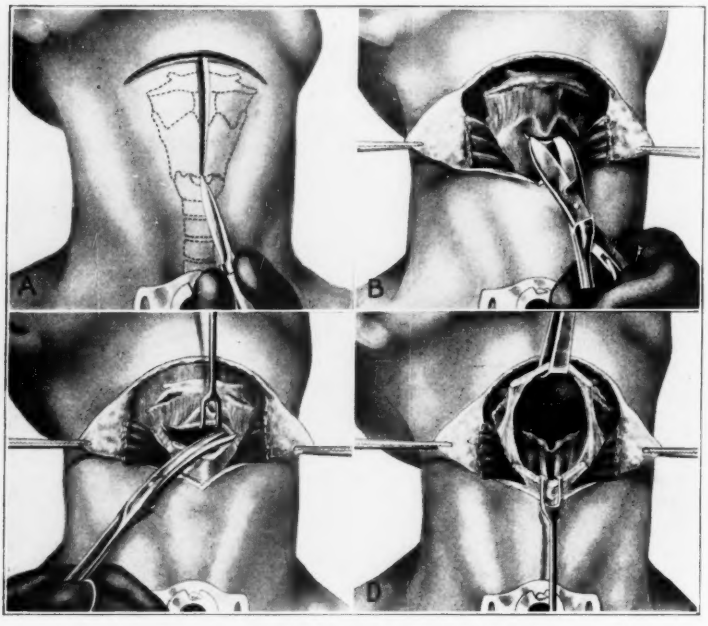

Fig. 1.—*A*, cross bow incision; *B*, section of the thyroid cartilage above the anterior commisure; *C*, resection of the superior fragment of the thyroid cartilage and of the epiglottis; *D*, retraction of the thyroepiglottic fragment with the vocal cords and the pharynx apparent.

the laryngeal skeleton on which the epiglottis rests is held by a Museux forceps, producing strong tension and shortening the time of operation.

Fourth Step.—Section of the preepiglottic layers, the knife passing between the epiglottis and the hyoid bone, and ablation of the epiglottis and the portion of the thyroid cartilage.

Fifth Step.—Resection of the body of the hyoid bone, previously separated from its muscular attachments.

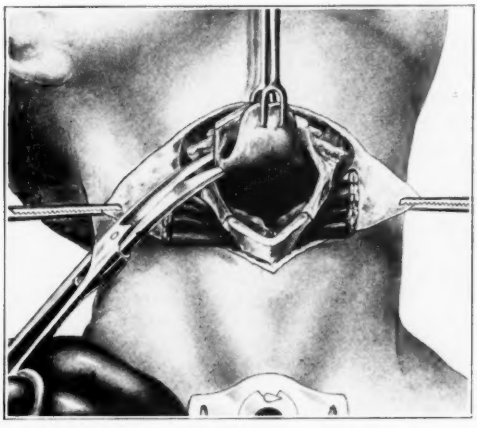

Fig. 2.—Preepiglottic resection of body of the hyoid bone.

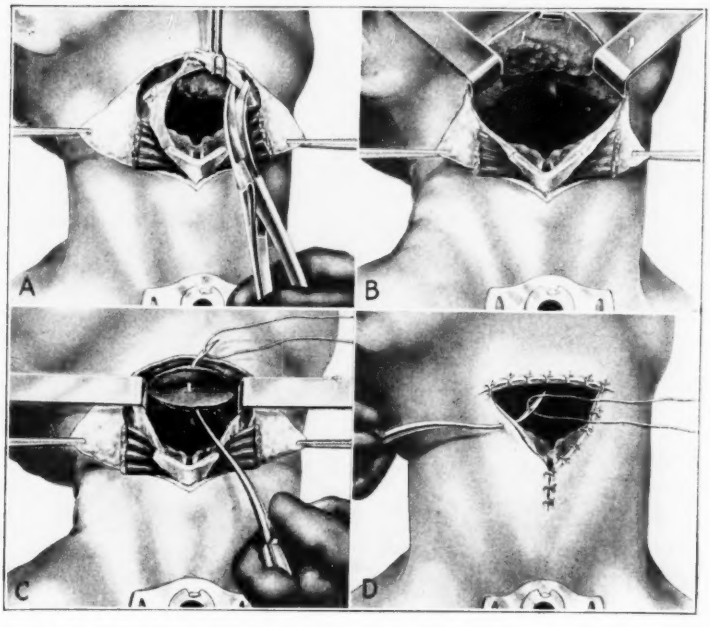

Fig. 3.—*A*, section of the hyoid bone; *B*, exposition of the base of the tongue with the tumor; *C*, suture of the base of the tongue following removal of the tumor; *D*, suture of the skin to the pharyngeal mucous membrane.

Sixth Step.—Fixation of the base of the tongue with Museux forceps and delivery through the operative opening by easy traction.

Exploration by sight and with the fingers permits the operator to learn the precise limits of involvement. Normal tissue is then incised, and all diseased tissue is removed from the base of the tongue.

Seventh Step.—Placement of a suture of strong silk at the opening in the base of the tongue.

Eighth Step.—Formation of a pharyngostomy opening by suture of the skin to the mucous membrane of the laryngeal vestibule and the piriform sinuses on the sides and at the base of the tongue, above and forward.

Ninth Step.—Placement of an alimentary tube through the nasal fossae and pharyngeal packing by the Mikulicz technic.

This packing, by pressing on the vocal cords, prevents the collapse of the trachea and entirely blocks the airway. In some cases nothing prevents one from making a temporary suture of the vocal cords. If the passage of the alimentary tube through the nose proves disagreeable to the patient, a gastrostomy fistula can be made.

Use of the translaryngeal approach in operations on the base of the tongue offers, in addition to the advantage of security, the opportunity of observing for a long time the development of the lingual cicatrization and of placing tubes of radium, if this is thought necessary.

University of Bordeaux.

PERILYMPH: ITS RELATION TO THE IMPROVEMENT OF HEARING WHICH FOLLOWS FENESTRATION OF THE VESTIBULAR LABYRINTH IN CLINICAL OTOSCLEROSIS

JULIUS LEMPERT, M.D.
NEW YORK

ERNEST GLEN WEVER, Ph.D.
AND
MERLE LAWRENCE, Ph.D.
PRINCETON, N. J.
AND
PHILIP E. MELTZER, M.D.
BOSTON

IN A PAPER read before the combined meeting of the sections on otolaryngology of the New York Academy of Medicine and the Philadelphia College of Physicians, March 20, 1940, one of us (J. L.).[1] stated:

> It has been known and observed for very many years that when a fistula is made in the vestibular portion of the bony capsule of the labyrinth in an otosclerotic ear, before cochlear nerve degeneration has taken place in the conversational frequencies, there occurs an immediate improvement of hearing for air-borne sound of the highest obtainable degree in that patient. Most otologists who observed this phenomenon, and some who occupied themselves with the development of the surgery for otosclerosis, have always believed that the improvement of hearing resulting from such a fistula was the direct result of the decompression of a supposedly existing, but never proven, increased intralabyrinthine fluid pressure. Despite their observation that the hearing improvement could be temporarily maintained after such a fistula was covered and sealed tightly with a membrane, thus permitting the perilymph to refill the perilymph space, they still adhered to the theory of decompression.
>
> Holmgren[2] argues that there exists the possibility of the perilymph being resorbed through the membrane covering the fistula. Sourdille[3] advanced a half-bottle theory to support the theory of decompression.

From the Lempert Institute of Otology and the Lempert Research Foundation, Inc.

1. Lempert, J.: Endaural Fenestration of the Horizontal Semicircular Canal for Otosclerosis: Indications, Technique, Observations as to Early and Late Post-Operative Results, Laryngoscope **51**:330-362 (April) 1941.

2. Holmgren, G.: The Surgery of Otosclerosis, Ann. Otol. Rhin. & Laryng. **46**:3-12 (March) 1937.

3. Sourdille, M.: New Technique in the Surgical Treatment of Severe and Progressive Deafness from Otosclerosis, Bull. New York Acad. Med. **13**:673-691 (Dec.) 1937.

My own observations have failed to reveal any facts which could help support this theory. On the contrary, they all pointed away from it. At no time was I able to observe an escape of perilymph into the mastoid wound which could compare to the escape of spinal fluid following the minutest opening of the subarachnoid space. I never saw the perilymph reach beyond the level of the lumen of the semicircular canal, though I have patiently watched for it for periods of as long as two hours, thus convincing myself that the perilymph was never under increased pressure in these cases. By removing the perilymph and watching for it to refill the perilymph space, the slowness with which the perilymph entered the perilymph space led me to suspect that there must exist a natural barrier between the cerebrospinal fluid system and the perilymph space which controls the flow of perilymph and permits only as much perilymph to get through as is necessary to cushion the membranous labyrinth with its endolymph, and enough to maintain the necessary amount of pressure relationship between the perilymph and endolymph, but no more. Whereas, perhaps in and under certain conditions the amount of endolymph may be increased, this is always at the expense of the perilymph space, which then permits a lesser amount of perilymph to enter and cushion the endolymph. Thus a change in normal pressure relationship between the perilymph and endolymph may occur, but no increased perilymph pressure within the lumen of the canal was ever observed to exist.

If the decompression theory had a basis in fact, a fistula in the cochlear promontory should result in improved hearing, but it never does. Neither does the creation of a new window in the external semicircular canal improve hearing when either the round window alone or both the oval and round windows are functionally impeded. Whereas a new window created in the external semicircular canal in the presence of a functionally impeded oval window does improve hearing by air conduction, if the round window membrane is normal. Since two functionally unimpeded windows, one in the vestibular part and another in the cochlear part of the bony labyrinthine capsule, are essential to improve air conduction hearing, and since it is possible to maintain the hearing improvement obtained by fistulization after covering and sealing the fistula with a membrane, I am convinced that the hearing improvement obtained following fistulization of the external semicircular canal is not the result of decompression of intralabyrinthine fluid pressure but rather the result of the mobilization of the perilymph and endolymph by air-borne sound, which was heretofore hindered by the functionally impeded oval window, and which the newly created window in the external semicircular canal again makes possible.

The foregoing statement of March 1940 was based on observations made in 150 fenestration operations performed up to that time. Today, on the basis of more than 4,000 fenestration operations, this statement can be reaffirmed: Fluid never escapes from the perilymph space beyond the bony margins of the newly created fenestra into the mastoid wound.

Further observations that are pertinent to this point come from performance of the Lempert decompression operation for the relief of vertigo in Ménière's disease. In the earlier form of this operation the semicircular canal was opened; and this opening of the semicircular canal failed in every instance to produce any visible escape of perilymph. In the present form of this decompression operation the stapes and the round window

membrane are removed instead, and, as soon as this is done, the perilymph escapes freely.

These facts find a ready explanation in certain histologic peculiarities of the perilymph spaces of the labyrinth. As is general for all the vertebrates,[4] and as we have verified in detail for the monkey and man (figs. 1, 2 and 3), the perilymph space of the semicircular canals and the vestibule is pervaded by a fibrous trabecular system, a meshwork of delicate connective tissue that extends from the perilymphatic endosteum-lined walls to the enclosed endolymphatic labyrinth and is complete with

Fig. 1.—Perilymphatic trabeculae surround the membranous ampulla of the posterior semicircular canal. Note the congested vessels.

arteries and veins. This meshwork entraps the perilymphatic fluid like the tissue of a sponge, and effectively prevents any free and continuous flow. On the other hand, the cisterna perilymphatica just beyond the footplate of the stapes, the scala vestibuli and the scala tympani of the cochlea are devoid of any trabecular network; the perilymph there is unobstructed and it flows out freely when the oval and round windows are opened (fig. 4).

4. de Burlet, H. M.: Vergleichende Anatomie des statoakustischen Organs, in Handbuch der vergleichenden Anatomie der Wirbeltiere, Vienna, Urban & Schwarzenberg, 1934, vol. 2, pp. 1293-1444.

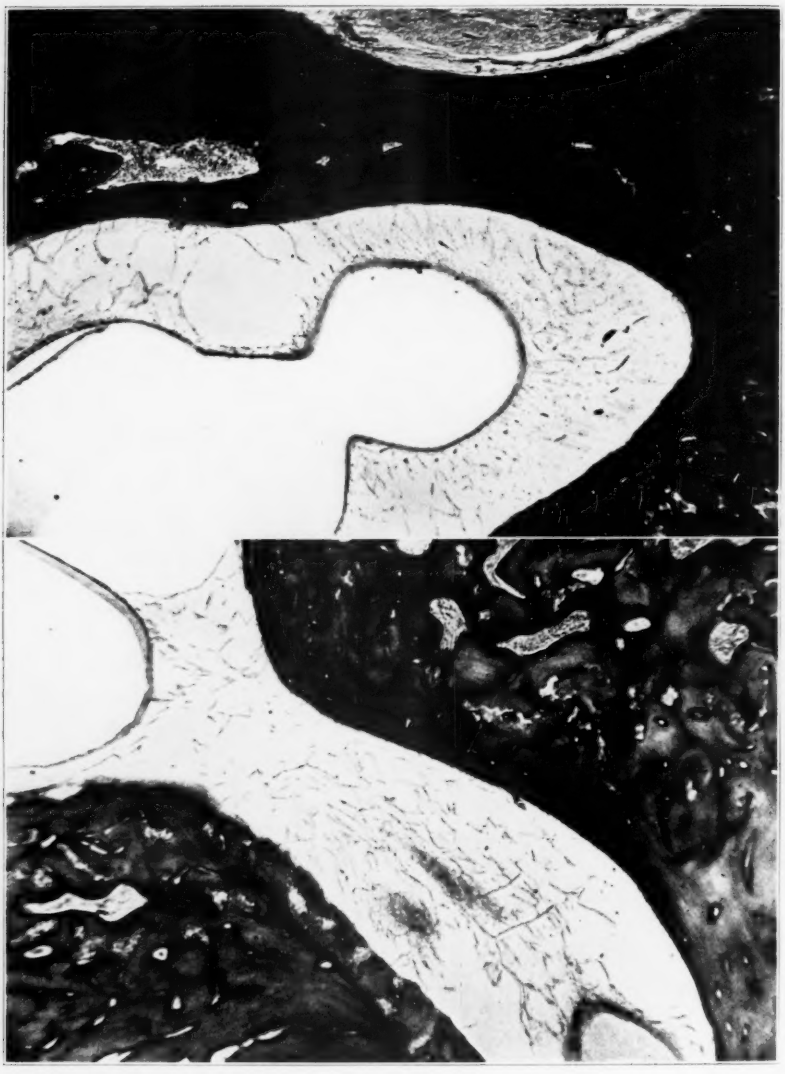

Fig. 2.—Upper: The perilymphatic trabeculae support the membranous labyrinth and convey the minute vascular channels in the horizontal canal of an infant aged 2½ months. Lower: Perilymphatic trabeculae support the endolymphatic labyrinth and convey the vascular channels in the region of crus commune of an infant aged 2½ months.

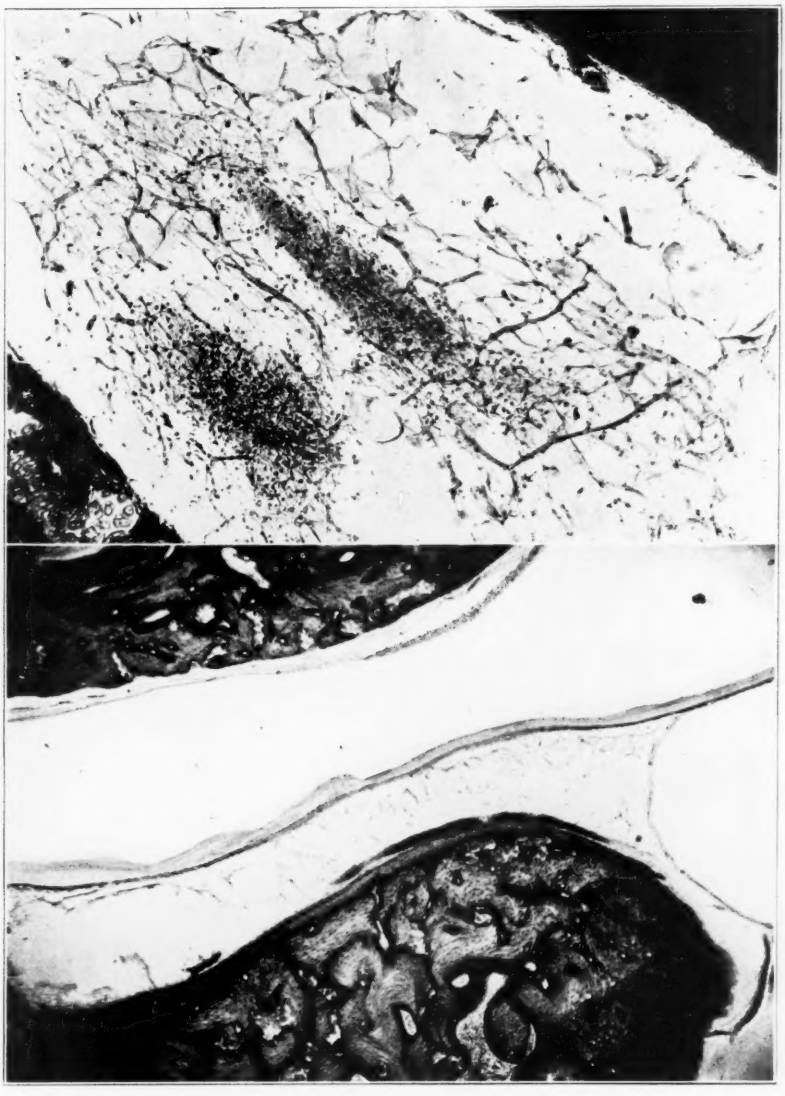

Fig. 3.—Upper: Detail of the intricate meshwork of endothelial cells which comprise the perilymphatic trabeculae and convey the minute vascular network of an infant aged 2½ months. Lower: A blood vessel travels through the perilymphatic trabeculae, parallel to the bony wall of the crus commune, of an infant aged 2½ months.

Holmgren [5] in a recent article again revived his contention that the hearing improvement following fenestration is the result of drainage of perilymph, which is under pressure in clinical otosclerosis. In referring to the instance in which hearing improved during the creation of the fenestra in clinical otosclerosis he stated:

> . . . that this great hearing improvement appeared at the same moment as perilymph fluid was noted, even if in such cases no opening in the osseous canal could be observed even with ten times magnification.

From this statement it would appear that the perilymph pressure is so high that it is strong enough to penetrate the perilymphatic endosteum

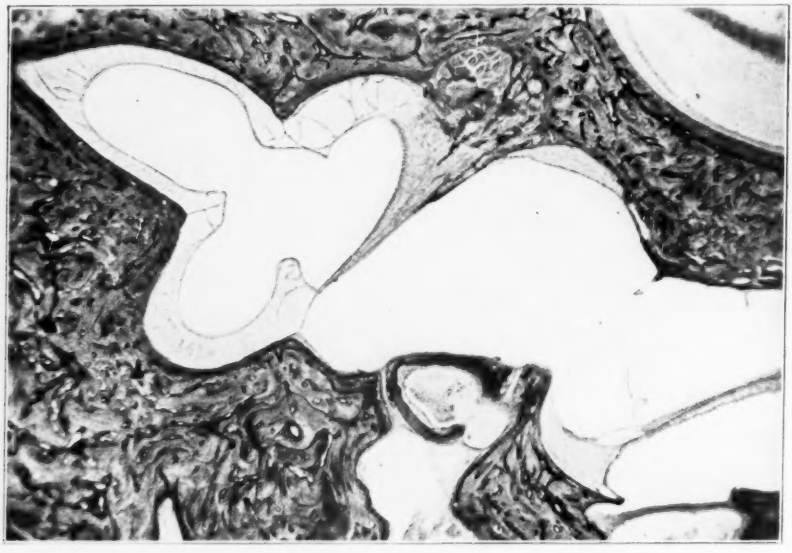

Fig. 4.—Perilymphatic trabeculae support the endolymphatic labyrinth in the regions of the sinus utriculi and the ampullae of the superior and horizontal canals of W. F., 14 years old. They are completely absent in the cisterna perilymphatica, just beyond the footplate of the stapes, and in the scala vestibuli and the scala tympani.

and the endosteal and enchondral bony layers of the labyrinthine capsule without a visible perforation. Holmgren [5] asserted that failure of otologists doing fenestration surgery to observe the escape of perilymph is due to the fact that they make the fenestra in the presence of fluid within the mastoid cavity. He stated that if they would fenestrate in a dry field they would readily observe the escape of perilymph under pressure.

5. Holmgren, G.: To the Development of Otosclerosis Surgery, Acta otolaryng. **37**:26-29 (Feb.) 1949.

One of us (J. L.) has fenestrated in both dry and wet surgical fields and at no time has been able to observe perilymph escaping through the newly created vestibular fenestra. Furthermore, it is beyond comprehension how perilymph could penetrate the nonsevered perilymphatic endosteal membrane and the endosteal and enchondral layers of the bony capsule without a perforation visible under a magnification of ten times.

If it were true that the escape of perilymph would be necessary to improve the hearing in clinical otosclerosis, then the very leaving of the endosteal membrane intact, if this were always possible after removing the entire osseous wall, would still prevent such improvement, because no escape of perilymph can take place through an intact endosteum devoid of perforations and much less through an intact bony capsule of the labyrinth without perforations visible under a magnification of ten. One of us (J. L.) in 1944 performed several hundred fenestration operations, leaving the endosteum intact as often as possible, which is not always possible, and never saw perilymph escaping under pressure whether the endosteum was intact, perforated or removed. However, it was always observed with this technic and all the other variations of technic in the fenestration operation

that this great hearing improvement appeared at the same moment as an opening through the osseous canal is made down to the endosteal perilymphatic membrane and before the perilymphatic space has been opened.

CAN THE HEARING LOSS IN CLINICAL OTOSCLEROSIS BE DUE TO INCREASED PERILYMPH PRESSURE?

Before attempting to answer the question posed in the foregoing title it is at once necessary to call attention to the fact that there has never been any scientific proof that the perilymphatic pressure is greater in an otosclerotic ear than in a normal ear. However, if the improvement of hearing which follows the fenestration operation in clinical otosclerosis were the result of a permanent decrease of a supposedly existing increased perilymph pressure, then the natural inference should be that increased perilymphatic pressure can either directly or indirectly cause deafness.

In 1942 Békésy [6] investigated experimentally in temporal bones of fresh cadavers whether increased vestibular perilymphatic pressure will interfere with sound being transmitted through the middle ear and through the perilymphatic cochlear fluid. He stated:

It has been stated that a high static pressure in the cochlea pushes the stapes out and reduces its mobility. If the stapes is relatively immobile for many years, blood supply to, and other functions of, the ear are impaired and this leads finally to otosclerosis.

6. Békésy, G. V.: Ueber die Schwingungen der Schneckentrennwand beim Präparat und Ohrenmodell, Akust. Ztschr. **7**:173-186, 1942.

To verify this assumption I changed the static pressure in the vestibular organ by injecting water by means of a hypodermic needle with a weight on the piston of the syringe. By rotating the piston continuously with special equipment it was possible to reduce the friction in the glass tube so that the pressure in the fluid could be calculated from the weight.

To determine the maximum change which might be expected in the transmission of the vibrations to the inner ear I first measured the maximum static pressure that the inner ear could bear. In the experiments I found that at a pressure of about 4 atmospheres a faint click was heard in the temporal bone, and after this the bone began to drip. Probably one of the blood vessels had burst. Special preparations of the round window showed that the round window ruptured at static pressures of from 4 to 7 atmospheres. Since the stapes was not affected by the maximal pressures which could be produced in the cochlea, I measured the force necessary to tear it out by a hook attached to the stapes itself. This force was about 320 grams, which corresponds to a pressure of 16 atmospheres on the footplate of the stapes.

After these preliminary measurements on several very fresh temporal bones the volume displacement of the round window was measured for 300 and 1000 cycles per second by adjusting the current in the earphone so that the tone in the ear of the observer was minimal. This adjustment was so exact that the smallest change in phase or amplitude of vibration of the round window could easily be detected. In general, no changes were observed as the inner pressure in the cochlea was continuously increased, until just before the inner ear started to drip, when there was a change in amplitude of about 10 to 20 per cent. Therefore, increasing the pressure in the inner ear probably does not immobilize the footplate of the stapes.

In spite of this experimental proof furnished by Békésy that increased perilymphatic pressure does not affect the mechanism by which sound is transmitted through the middle ear and through the perilymphatic cochlear fluid, Holmgren in 1949 is still of the impression that the improvement following the fenestration operation is due to a decrease of perilymph pressure. Because of our great respect for Holmgren as an otologist and scientist and because of our constant desire to seek the scientific truth in otology, we decided to carry the investigation of the effects of perilymph pressure further than Békésy did. Our research project had two particular objectives in view: First, to investigate whether Békésy's experimental findings in cadaver material, that increased perilymphatic fluid pressure does not interfere with the mechanism by which sound is transmitted through the middle ear and through the cochlear fluid, can be substantiated in the living animal; second, to determine whether increased perilymphatic pressure will interfere with the activity of the sensory cells of the organ of Corti.

EXPERIMENTAL TESTS

Experiments were carried out on a monkey by the following procedure:

Through a postauricular incision, the antrum of the mastoid process was opened. The posterior bony wall of the external auditory canal was removed,

exposing to view the external semicircular canal and the round window niche without disturbing the tympanic membrane and the ossicular chain. An electrode consisting of a wire tipped with platinum foil was placed in contact with the round window membrane, and an indifferent electrode was placed in muscle tissue at the edge of the incision. From these electrodes the cochlear potentials were observed in response to stimulation with sound vibrations.

The electroacoustical apparatus is shown in figure 5. Tones were produced by means of audiometer and amplifier working into a loud speaker. The sounds were conveyed by a tube to a point opposite the animal's ear. The electrical potentials picked up from the cochlea were led through a shielded cable to an amplifier and then to a selective voltmeter (a General Radio Type 736-A wave

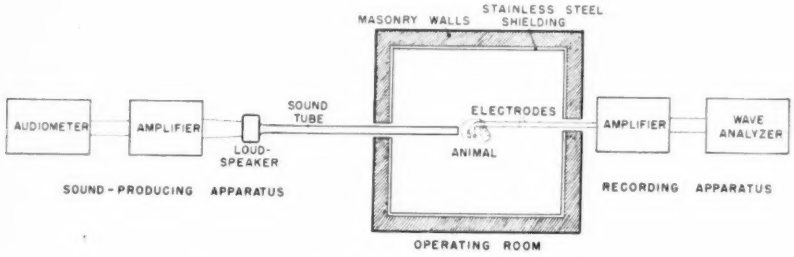

Fig. 5.—Apparatus for investigation of the electrical potentials of the cochlea.

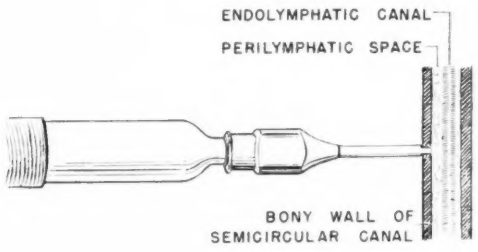

Fig. 6.—A special pressure needle is shown inserted through an opening in the bony wall of the semicircular canal.

analyzer) for measurement. The operating room was acoustically isolated and electrically shielded, and, as is always necessary in this type of experiment, a number of tests were carried out to exclude the possibility of artefacts.

After a series of normal observations, a round opening was drilled through the bony wall of the ampullated end of the lateral semicircular canal up to the perilymph space without injuring the endolymphatic labyrinth. With a special tool this opening was reamed to a diameter just fitting snugly a no. 25 hypodermic needle. A special "pressure needle" was made by grinding flat the end of a no. 25 hypodermic needle and slipping over it a sleeve made of a piece of a larger needle, and soldering this piece so as to leave the end of the smaller needle protruding about 0.5 mm. (fig. 6). The end of this needle was inserted in the

opening in the bony wall of the canal. The sleeve prevented its entering too far and aided in the production of a tight junction.

The pressure needle was connected by rubber tubing and a Y tube to a large hypodermic syringe and a pressure gage (fig. 7). Pushing on the plunger of the

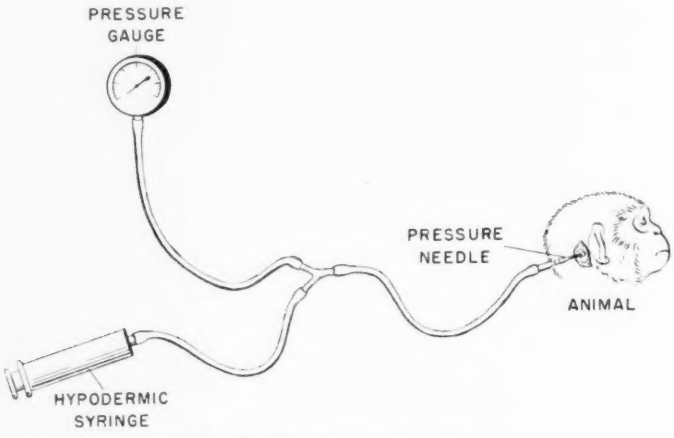

Fig. 7.—The pressure apparatus.

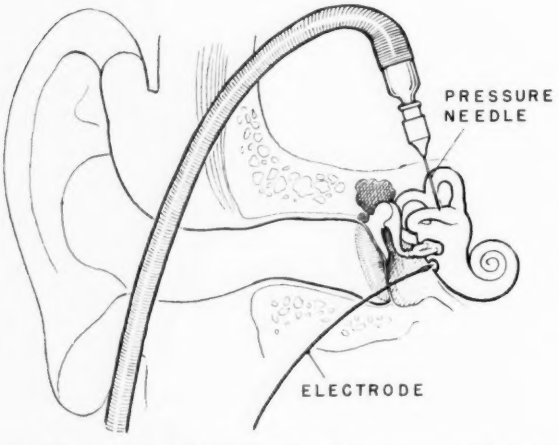

Fig. 8.—Detailed sketch of the manner in which the pressure needle is inserted into the lateral semicircular canal and the recording electrode applied to the round window membrane.

syringe compressed the air in the system to a pressure indicated by the gage, and this same air pressure was applied to the perilymphatic fluid of the canal.

Figure 8 shows in detail the placing of the pressure needle and the recording electrode.

While a tone was sounded at a constant intensity, the cochlear potentials were measured for the zero pressure condition, and then the pressure was raised to a desired level and the measurement repeated, after which the pressure was restored to zero for a further measurement. This procedure continued, with alternate observations at zero pressure and various positive pressures, for a total of twelve trials. In most of the trials the stimulating tone was 512 cycles. That the pressure was communicated to the cochlea was proved by visible movements of the round window membrane.

As the accompanying table shows, the exertion of positive pressures up to 50 mm. of mercury caused no appreciable changes in the magnitude of the cochlear potentials.

Effects of Exertion of Positive Pressures on Magnitude of Cochlear Potentials.

Trial	Tone	Zero Pressure Before	Positive Pressure, 10 Mm. Hg.	Zero Pressure After
1	512	23	23 Positive pressure 20 mm. Hg.	23
2	512	25	25 Positive pressure 50 mm. Hg.	23
3	512	15	16	16
4	512	7	7	7
5	512	5.5	5.5	5.0
6	512	15	15	15
7	512	5	5	5
8	512	6	6	4
9	512	16	16	16
10	512	15	15	15
11	512	5	6	6
12	2,048	19	19	19

CONCLUSION

Our observations in the living monkey are in full agreement with those of Békésy in human cadaver material. An increase of perilymphatic pressure up to 50 mm. of mercury has no effect on transmission of sound vibration through the middle ear and the cochlear fluid. Our observations show further that this increase of fluid pressure does not interfere with the functioning of the sensory cells of the organ of Corti.

Since we fail to find any evidence of deafness as a result of an increase of perilymph pressure, it is obvious that we cannot expect a relief of deafness from a reduction of such pressure. These results, therefore, fail to support either the pressure theory of otosclerosis or the decompression theory of the effects of fenestration. The improvement of hearing that follows fenestration of the vestibular labyrinth is not a result of a reduction of fluid pressure, but must be accounted for in some other way.

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SOME SUGGESTIONS FOR SPEECH RECEPTION TESTING

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NEW LONDON, CONN.

OF THE many abilities possessed by the human ear, one is of prime biologic and social importance. That is the ability to hear the human voice. Many writers have pointed out the nice correspondence between the physical dimensions of speech and the stimulus regions to which the ear is most sensitive. Designers of hearing aids strive first and foremost toward improved intelligibility of speech. The American Medical Association gives speech reception exclusive consideration in its notation system for auditory deficiency.

In spite of this emphasis on speech, however, the actual clinical testing for speech reception at the present moment lags far behind the testing for reception of other kinds of sound. In reliability and validity the procedures for testing reception and discrimination of pure tones, or of bands of noise, are both superior to the usual procedures for testing speech reception.

This does not mean that reception of speech for some reason cannot be measured as accurately as reception of any other type of sound. It does mean that methods of testing speech reception with satisfactory precision are peculiarly slow to diffuse from the experimentalist to the clinician.

Accurate and rapid assessment of speech reception is now possible for the up-to-date clinician. Yet, today, the traditional free voice test, with its many inherently unreliable aspects, is still commonly used in clinics and private offices over the country and is almost universally used in our huge military establishment. There are, indeed, few centers which test speech reception in any other fashion.

The purpose of this article is to present suggestions for those who wish to improve their testing for ability to hear speech, and perhaps to attempt their own standardization of one or more of the newer laboratory tests.

THE PROBLEM

Theoretically, the free voice test is based on the law of inverse square, which states that sound pressure decreases as the square of the distance. The tester stands, let us say, 15 feet (4.5 meters) from

From the Medical Research Laboratory, Submarine Base. The opinions expressed are solely the author's, and do not necessarily reflect official Navy policy.

the ear under examination and speaks at such an intensity that a normal ear would just hear the words. The voice is to be kept at this same intensity throughout the test; if the patient does not respond, the tester moves nearer to repeat the phrases, trusting in the reduced distance to make his voice louder at the patient's ear.

The most obvious shortcoming of this procedure is that in the usual testing alley as the tester moves toward the patient the law of inverse square does not cause the tester's voice to get much louder to the patient. The increase of intensity is so slight for the first 13 feet (4 meters) that that alley distance is effectively wasted. At a distance of only 6 inches (15 cm.) from the patient's ear, the tester's voice is only 15 decibels louder than if the distance between voice and ear were the full 15 feet (4.5 meters). Obviously, if no other factor than distance were present in the usual free voice test, only normal-hearing or very slightly deaf ears could ever be accurately tested.

What actually happens in most free voice testing is that the tester varies the intensity of his voice within wide limits. His supposed dependence on distance is mostly illusory.

An experienced tester will, from necessity, dispense almost entirely with distance as an aid in controlling intensity, and attempt to regulate the intensity of his voice as it leaves his lips. As he approaches the deafened patient from the initial 15 feet, he uses a more and more intense voice. An analysis of the published reports of one vastly experienced clinician revealed that the voice intensity increased logarithmically while the testing distance decreased arithmetically.[1]

With this particular clinician, when a patient received a voice score of 20 feet (6 meters) a voice intensity was used which a normally hearing person could hear at 43 feet (13 meters), but when a patient received a voice score of 1 foot (30 cm.) a voice intensity was used which a normally hearing person could hear at 2,015 feet (614 meters). These limits, between a low whisper and a loud shout, are manifestly necessary for testing slightly, moderately and severely deafened ears, but the accurate production of such a range of voice intensities is difficult. From this difficulty stems most of today's dissatisfaction with the free voice test.

The problem, then, is to find a quick, reliable method of controlling the intensity of speech at the patient's ear. We have seen that the law of inverse square offers limited help, and that intensity of speech at the tester's lips must be controlled over such a range that only the most experienced clinicians can hope, in the traditional form of the test, to attain a usable level of reliability.

1. Harris, J. D.: Free Voice and Pure Tone Audiometer for Routine Testing of Auditory Acuity: Studies on Comparative Efficiency [fig. 1], Arch. Otolaryng. **44**:452-467 (Oct.) 1946.

Recent research has attacked this problem from three directions: (1) by using a sound level meter to aid testers in controlling their voice intensities, (2) by using a microphone-amplifier-loudspeaker network to present the speech, with variable resistance to control final voice intensities at the patient's ear, and (3) by using the same network, but with a phonograph pickup substituted for a microphone. These three approaches will be considered in order.

Use of the Sound Level Meter.—An instrument which is extremely useful for research and testing in audition is an electronic device, the sound level meter, which indicates in clear physical units the sound pressure at its microphone. Sound level meters are now easily obtained commercially and are simple to use. One model, which meets all requirements of the American Standards Association, can be slipped into the coat pocket.[2]

Dr. E. P. Fowler Jr. first recognized the possibility that the sound level meter could be used to investigate the free voice test.[3] The instrument, particularly if it has a highly damped needle, so that the intermittent irregularities of the intensity of normal speech are somewhat smoothed out, will enable the tester to adopt a relatively constant level of speech intensity or to change it by definite amounts. The error involved will be considerably less than that involved in the traditional procedure, in which the tester regulates speech intensity by himself listening to the sound of his own voice.

The use of a handy portable instrument to place and vary the intensity of one's voice would seem the minimum equipment necessary for the testing of speech reception. Fowler had demonstrated that the distance at which a sample of typical speech tests could just be heard varied up to 200 per cent. Such a variation, which makes absurd any fine interpretation of free voice scores, would tend not to occur if the sound level meter were properly employed.

(It may not be out of place here to indicate the great value this instrument can have in defining another important variable in speech reception testing, namely, the amount of ambient noise in the testing room. A quick glance at the meter placed in the position usually occupied by the patient's head and read during typical testing hours will do much to determine the suitability of that room for such work and will materially improve the interpretation of data taken under those conditions.)

2. This model is available from Hermon Hosmer Scott, Inc., 385 Putnam Ave., Cambridge, Mass.

3. Fowler, E. P., Jr.: The Discovery and Evaluation of Otic Cripples, Arch. Otolaryng. **45**:550-561 (May) 1947.

In using the meter to standardize one's own free voice test, the tester stands at a convenient distance from a normally hearing patient, say 15 feet, and regulates his voice so that the patient can just repeat the phrases. The average reading of a broad sample of speech at that intensity is noted from the meter, placed about 2 feet (60 cm.) from the tester's lips and to one side. This is repeated for perhaps a dozen normally hearing patients, and the final average reading determined. Then, with the tester, meter and patient in the same positions in the room, the tester can, by watching the meter, produce a voice intensity which can just be heard by the average normal ear. If the patient cannot respond correctly to that intensity, he is "hard of hearing" for speech. Next, the extent of his deficiency is quickly determined with further use of the meter, as follows: The tester raises his voice until the patient does begin to respond correctly. At that intensity the tester presents speech samples until he has confidence in the reliability of an average meter reading. Then, quite simply, the hearing loss is the difference in decibels between that reading and an average reading for normally hearing persons taken under the same standard conditions.

The unit used here, the decibel, has come to be the only notation used by all communications engineers, psychologists, physiologists and some otologists to describe speech intensity levels. It is the unit used in all pure tone audiometry. There seems little doubt that in the field of speech reception testing it will quickly supplant the archaic distance fraction among forward looking clinicians interested in reliability and precision of statement. If an otologist should report that a certain patient is so many decibels deafer than normal for ordinary speech, he will be certain to be understood by most readers. If necessary, a table converting decibel loss to distance fraction can be used; thus, the values of both scales may be secured.[4]

The foregoing discussion showing how the sound level meter can be used as an important adjunct of the free voice test does not imply that all difficulties inherent in the traditional test are overcome. Problems of masking, of inherent differences of intensity of speech sounds, of the selection of proper speech items, etc., are still present in this as in any other speech reception test. Nevertheless, one detrimental source of variation, namely, random fluctuations of over-all speech power, is controlled to a good extent.

The Monitored Live Voice.—One difficulty of using the sound level meter is that the tester must learn to speak at a fairly constant level

4. Harris, J. D.: Interpretations of Measurements of Auditory Threshold, in Encyclopedia of Vocational Guidance, New York, Philosophical Library, Inc., 1947, vol. 1, pp. 443-445.

at any one of a wide variety of levels depending on the acuity of the patient. This is easier said than done. Moreover, speaking either very softly or very loudly tends to distort the speech sounds.

To eliminate this difficulty, one may substitute a high fidelity communication system between tester and patient, locating the patient in another room so that he cannot hear speech directly from the tester's lips. This procedure has been used most extensively by the Bell Telephone Laboratories.[5] The system will amplify ordinary speech even beyond the loudest shout of which the tester is capable. By simply changing a resistance dial calibrated in decibels, the tester can transform any phrase he utters, always at the same effortless intensity, into a very weak or a very loud sound. The tester monitors his speech by watching a meter. A simple talkback switch allows him to record the patient's response, if any. As with the sound level meter, hearing loss for speech is described as so many decibels below that of normal subjects.

A communication system adequate in all respects costs no more than a good radio, perhaps $200 to $300, and can be installed by any radio repairman. Indeed, the components of a good radio-phonograph can easily be reassembled and used for the purpose. The only extra equipment needed is a microphone, a wattmeter to monitor the speech intensity at the tester's lips, and a resistance dial worked in decibels to control the final intensity at the patient's ear. Figure 1 shows how the equipment may conveniently be laid out, with suggestions about each component part.

The monitored live voice test is conducted in almost exactly the same way as the traditional free voice test. The tester speaks at constant intensity, watching his wattmeter the while, and changes his resistance dial until the patient begins to respond correctly. At that point, the hearing loss for speech is calculated as the difference in decibels between the resistance dial for that patient and the dial setting for known-normal ears.

The patient may respond through a talkback system—this may simply be a pair of interoffice squawk boxes—or, in some cases, as with children or those of low intelligence, a normally hearing assistant may sit beside the patient and record responses.

It may thus be seen that the monitored live voice system preserves all of the advantages of speed and flexibility of the traditional free voice test. In addition, it provides a much superior method of varying speech intensity at the patient's ear.

The superiority of the monitored live voice test can easily be shown statistically. Under routine administration, the traditional spoken voice

5. Fletcher, H.: Speech and Hearing, New York, D. Van Nostrand Company, Inc., 1929.

test will have almost no reliability,[6] while under the same routine conditions the monitored live voice test has a test-retest reliability of about +0.70, or very nearly as good as that of routine pure tone audiometry.[7]

It is true that an experienced clinician in his free spoken voice test can do considerably better than is usually found under routine testing; on the other hand, he can also improve on the routine reliability of the monitored system.

It would seem that with electronic control of intensity levels, speech reception testing has been put on a firm basis. With the use of this equipment, any alert clinician can learn to test the speech reception of "hard of hearing" patients with a precision hitherto unobtainable.

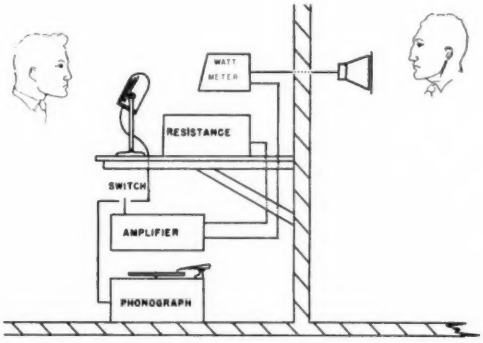

Fig. 1.—Equipment arranged for the testing of speech reception. The phonograph pickup, the microphone, the amplifier and the loudspeaker must be of such quality that ordinary speech seems quite natural to a normal-hearing person at the patient's position. Such a check is quite sufficient. Specifically, little or no distortion should occur between 100 and 4,000 cycles per second. Such units can be purchased at any radio store. The wattmeter, which multiplies volts times amperes, and the resistance box, which should contain 110 decibels in steps of 1 decibel, can be purchased from Daven Company, 191 Central Avenue, Newark, N. J.

The Phonograph Voice.—There remains, however, another important tool which the clinician must use if he wishes to approach laboratory precision. This is to substitute a phonograph pickup for the microphone in the monitored live voice equipment. This may simply be done by means of the two way switch shown in figure 1.

6. Shilling, C. W.; Everley, I. A.; and Harris, J. D.: Hearing Tests: An Evaluation, U. S. Nav. M. Bull. **44**:100-116, 1945.

7. Carhart, R.: Monitored Live-Voice as a Test of Auditory Acuity, J. Acoust. Soc. America **17**:339-349, 1946.

It might seem at first glance that using the phonograph voice rather than the actual voice is a step in the wrong direction. A certain amount of tester-patient rapport is lost, speed of presentation is inflexible, one is limited in choice of records, etc. Nevertheless, the recorded voice has definite advantages with a patient for whom the phonograph technic is appropriate. It is easier, it can with more confidence be turned over to assistants, test-retest results are more stable, and a record can be analyzed word by word.

A more basic advantage, however, of the recorded voice is that, by a rerecording technic, the individual words of any particular sample of speech sounds may be rendered very nearly alike in intelligibility. This likeness, or homogeneity, of intelligibility can never be achieved so well with either the free or the monitored live voice because of the wide difference in the relative intelligibility of words, some words being inherently much more easily understood than others—even though all words are produced at the same physical intensity.

In order to understand why homogeneous intelligibility is desirable, it will be helpful to refer to figure 2. On the baseline is found a scale of intensity levels, and on the vertical is found the percentage of words correctly heard. At more intense levels, toward the right of the figure, more words are correctly heard. A curve describing the increase in words correctly heard as the speech becomes louder is known as an "articulation curve" or "articulation function."

Figure 2 presents articulation curves for two lists of words. Both lists have been read by one speaker over the same communication system to the same subjects. After every 5 words, the intensity was increased 5 decibels, until all subjects reported most words correctly. One wishes to know, now, at what intensity these subjects could repeat 50 per cent of the words. (The 50 per cent point is adopted as a simple convention so that any patient's speech reception may be compared with a normal standard.)

It is plain from figure 2 that list A, with quite good homogeneity, defines these patients' 50 per cent point with slight experimental error. List B, on the other hand, defines the 50 per cent point with much greater error. Evidently, with words such as those in list A, only a few would be needed to assess the patients' speech reception; on the other hand, because of the inherent variability of intelligibility of the words in list B, many more words would have to be presented to reach comparable precision as to the patients' 50 per cent point. If more words are presented at each level, the irregularities from level to level will average out, and the curve in figure 1 for list B might smooth out so that the 50 per cent point is fairly unequivocal. But the presentation of these additional words costs more time and effort than most

clinics can afford, and in any case the curve for list B will never change its slope so that it approximates the steep slope for list A.

The conclusion is plain that homogeneous intelligibility, represented by as steep a slope as possible for data plotted as in figure 2, is one of the major goals to be approached in the testing of speech reception.

(*a*) Relation Between Intensity of Speech and Its Intelligibility: In their first experience with the monitored voice, clinicians are surprised that of two words which deflect the meter alike, one is clearly intelligible, the other not at all intelligible. Yet over-all intensity is only one of many factors contributing to intelligibility. Among these other factors are the relative intensity and temporal pattern of com-

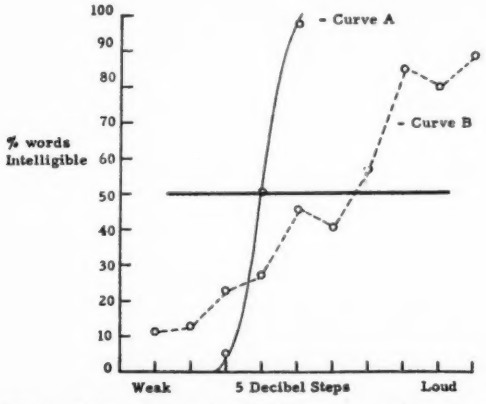

Fig. 2.—Effect of homogeneous intelligibility on precision of speech reception tests. *Curve A*: Words in this list are ideally homogeneous in intelligibility; the intensity at which 50 per cent are correctly heard is found with only slight error. *Curve B*: Words in this list are less homogeneous; the intensity at which 50 per cent are intelligible is found with much greater error.

ponent sounds, familiarity of vocabulary, differences of dialect, and others too numerous to mention.

It is obvious, of course, that a weak speech sound which is unintelligible can usually be made intelligible merely by increasing its intensity; in this sense the intensity of a speech sound and its intelligibility have the most direct relationship. But the characteristics of speech which go to make up its intelligibility are so many and complex that in any group of sounds one cannot tell which is the most and which the least intelligible word merely by knowing the most and the least intense.

The fallacy, then, in the use of the sound level meter or of any monitoring device lies in the assumption that if one can only make

all words equal in intensity those words will be equal in intelligibility. But within the intensity limits of ordinary speech that is not fully true.

A brief experiment well illustrates this point. A 50 word monosyllable list was recorded. This record was then analyzed for relative intelligibility, word by word, as follows: It was played over high quality head phones to a dozen normally hearing subjects at once, at such an intensity that only a few subjects could write down one or two words correctly. The intensity was then increased 5 decibels, and the whole list played over again. This process was repeated several times, each time the intensity being increased 5 decibels, until all sub-

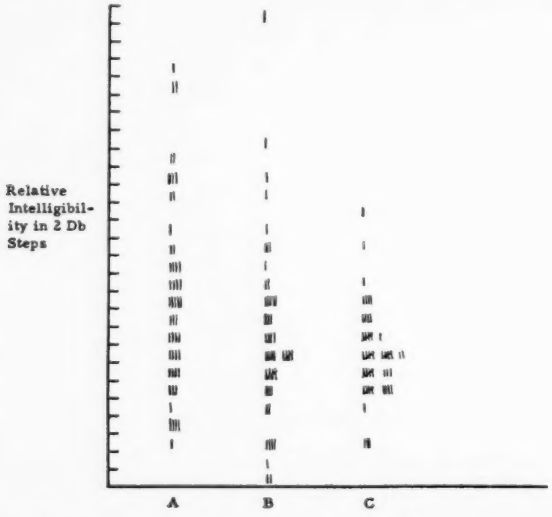

Fig. 3.—Frequency distributions of relative intelligibilities of 50 monosyllables under three conditions. *A*, Harvard phonetically balanced (PB) list 1, original recording. *B*, same list recorded for homogeneous intensity. *C*, same list recorded for homogeneous intelligibility.

jects were writing almost all words correctly. Then, for each word, the intensity was found at which 6 (i. e., 50 per cent) of the men wrote that word correctly. From these data one can state that a certain word would have to be, say, 8 decibels louder before it becomes as intelligible as the average word. Each word was thus assigned a relative intelligibility in terms of its intensity in decibels at the 50 per cent intelligible point.

The relative intelligibilities of all words in this particular recording may be found in column 1 of figure 3. It is seen that a range of

42 decibels exists between the easiest and the hardest word to understand, with a standard deviation (within which two thirds of the words should fall) of ± 10.5 decibels.

Now, according to the assumption that intensity and intelligibility of speech are identical, one could reduce this extreme scatter of intelligibility if only some technic were at hand to make the original words more nearly alike in physical intensity. This was done by measuring the intensity of each word on a high speed paper tape recorder. Then, in a rerecording, the intensity of each word was changed toward the average by adding or subtracting resistance in the recording circuit.

What, now, has happened to the relative intelligibilities of the words in this second record? These have been calculated from a new group of 12 normally hearing subjects, and appear in column 2 of figure 3. The range of relative intelligibility, far from being reduced, has increased to 51 decibels, though the standard deviation has increased to only 10.55 decibels. Evidently, equating the relative intenisty of words of a list of monosyllables does not have too much effect on the scatter of their relative intelligibilities.

For normal speech levels, then, one concludes that the relationship between intensity and intelligibility is obscured by the operation of other variables and that more homogeneous intelligibility must be sought by other means.

(*b*) Homogeneous Intelligibility Obtained by Selecting Words: It is possible, of course, to obtain homogeneous intelligibility by choosing a series of test words which have that characteristic. Polysyllables are more homogeneous than monosyllables, and steady, even-toned sentences are best of all, since intelligibility of such sentences is a sort of average of more speech sounds.

Hudgins and his colleagues [8] used the word selection technic to good advantage. They provided explicit directions for using the phonograph in a speech reception test and recommended a set of records consisting of scramblings of a master list of 84 spondees (bisyllables, both syllables accented). Analysis of one of these records, containing 72 words, reveals a spread of only 13 decibels between the least and the most intelligible word. This is considered very good when compared with similar data for unselected words.

May one not, then, unreservedly recommend these 84 words for all speech testing, whether the lists are used with the sound level meter, read over a monitoring system or given by phonograph?

8. Hudgins, C. V.; Hawkins, J. E.; Karlin, J. E., and Stevens, S. S.: The Development of Recorded Auditory Tests for Measuring Hearing Loss for Speech, Laryngoscope **57**:57-89, 1947.

One would wish to do so and thus solve at once many besetting problems. Unfortunately, it appears that in striving for homogeneous intelligibility the authors were forced to neglect the fact that their final list is far from representative of American phonemes. Thus their records, while admirable in conception and quality, must be regarded as stepping stones to further lists that reflect useful compromises among the several desiderata.

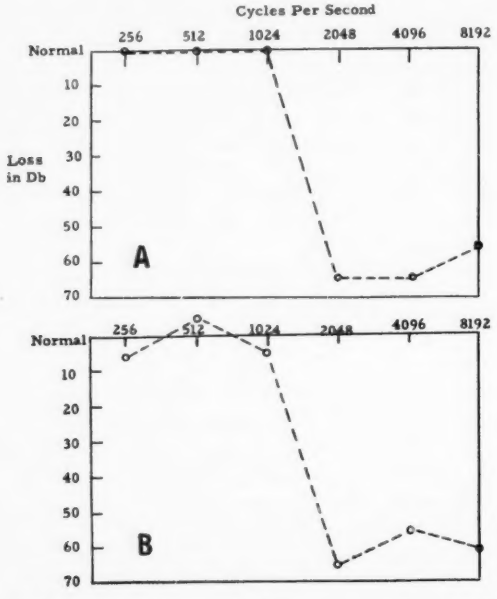

Fig. 4.—Slight effect of extreme deafness for tones above 1,000 cycles per second on intelligibility of spondees. *A*, audiogram of the right ear of patient J. E. H., whose acuity of hearing for words was 6.5 decibels below normal (spondee records 2 A and 2 B). *B*, audiogram of the right ear of patient H. L. S., whose acuity of hearing for words was 11.7 decibels below normal (spondee records 1 E and 2 A).

Specifically, it appears possible for a person to understand almost all 84 words perfectly even though he is profoundly deaf above 1,000 cycles per second (c.p.s.). Proof of the statement is contained in figure 4 *A* and *B*, showing the audiograms of 2 persons for whom these words were nearly as intelligible as for normal subjects.

Another line of evidence on this point comes from a study in which complete deafness above 1,000 c.p.s. was simulated in normal ears.

The spondees spoken of in a foregoing paragraph were played to 12 normally hearing subjects, and a typical articulation curve was drawn. This is curve A in figure 5. Next, these same spondees were played to another group of 12 normally hearing subjects exactly as before except that a filter passing only the frequencies of 1,000 c.p.s. and lower was inserted in the communication system. The resultant articulation curve is curve B in figure 5. There it will be seen that even with the severe frequency limitation the subjects nevertheless could understand at least 75 per cent of the words.

It seems clear that these spondee lists sample hearing of relatively low tone, especially, and that they do not indicate adequately deficits in the middle and high frequency regions of speech. Yet there must be

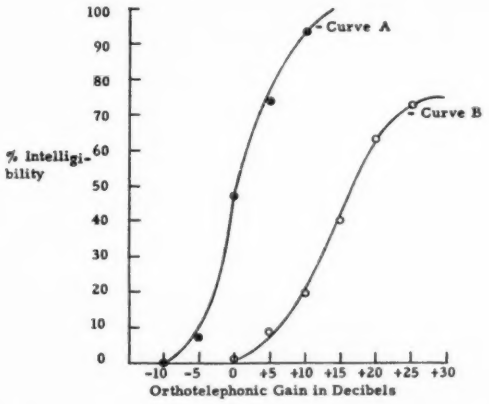

Fig. 5.—This chart shows ability to understand spondees even with extreme simulated high tone deafness.

NOTE: Speech played over a communication system at an orthotelephonic gain of 0 decibels will sound as loud to the patient as if the talker were speaking to him directly through the air at a distance of 1 meter.

A, articulation curve of spondee list 1 A, recorded in this laboratory and presented by phonograph to 12 normal-hearing subjects. A white noise (i. e., all frequencies present and all at the same physical intensity) was mixed with speech. *B*, articulation curve of the same record, presented to another group of 12 subjects. The same intensity of white noise was used. To simulate high tone deafness, a filter eliminating all frequencies above 1,000 cycles per second was inserted.

good acuity at these higher frequencies if speech in some situations is to be understood.

In cases in which the audiogram is known to be fairly flat, so that all frequencies through the speech range are heard equally well or equally poorly, there is no question but that these records provide an

adequate check on speech reception.[9] But with other types of audiograms they may be to some extent misleading.

The second approach, the use of connected discourse, reported by Falconer and Davis,[10] has much to commend it. The patient listens to steady speech and turns his own intensity dial until the sense is just apparent. A transcription of one of Fulton Lewis Jr.'s radio talks is recommended for its evenness of tone and simplicity of expression. A patient's reception of speech can be assessed quickly and easily. There seems no reason why a small library of records could not serve to test a wide variety of types of patients—children as well as adults. So far, no analysis of the frequency regions which carry the sense of these records has been made. It may be, of course, that any one of several relatively narrow frequency bands could, because of the strong psychologic tendency to fill in, serve to render the passage intelligible. If so, the analysis by this test of the functional status through the whole speech range of the patient's ear would be to that extent incomplete.

(*c*) Homogeneity Obtained by a Rerecording Technic: Here a third method of securing homogeneity—by phonograph rerecording—may be considered in detail. Suppose that one records a list of words and analyzes each word for relative intelligibility as described in the foregoing pages. Now suppose that on a rerecording one equates directly that which one wishes equated, namely, intelligibility. The amount by which each word should be raised or lowered during the rerecording is found from the first analysis.

When this technic is applied to the original record of figure 3 (it will be recalled that the vertical dimension shows relative intelligibility), it can be seen from column 3 of that figure that the scatter of relative intelligibilities has been greatly decreased: The range has shrunk from 42 to 26 decibels and the standard deviation from 10.5 to 5.04.

Evidently, equating the relative intelligibilities within a list of monosyllables has a marked effect, as in logic it should, and it is to that extent a useful tool in dealing with speech reception. But notice that the technic cannot be utilized by any system such as a sound level meter which can equate only intensity. What one wishes to obtain is not equal sound intensity at the patient's ear but equal intelligibility at the patient's brain, and for otherwise unselected speech sounds this can be directly obtained only with the recorded voice.

(*d*) An Effort to Use the Rerecording Technic in Speech Reception Testing: From all the foregoing considerations one concludes that two

9. Thurlow, W. R.; Silverman, S. R.; Davis, H., and Walsh, T. E.: A Statistical Study of Auditory Tests in Relation to the Fenestration Operation, Laryngoscope **58**:43-66, 1948.

10. Falconer, G. A., and Davis, H.: The Intelligibility of Connected Discourse as a Test for the "Threshold for Speech," Laryngoscope **57**:581-595, 1947.

major requirements of a speech reception test, (1) representativeness in sampling speech sounds and (2) homogeneity of intelligibility, can be secured by the following steps:

1. Selecting a group of words which does form an adequate sample of English speech sounds
2. Recording this list with high fidelity
3. Determining the relative intelligibility of each word
4. Rerecording, compensating for each word so that the relative intelligibility of all words tends toward an average.

Such a list of recorded words could be used in testing with about the same precision as the spondee lists of Hudgins and associates and should have somewhat greater significance for hearing deficiency in the middle and higher speech frequency ranges.

In this laboratory my associates and I have tried to follow the steps outlined, with some degree of success.

Our choice of words was dictated by practical as well as theoretic considerations. Theoretically, the ideal way to achieve adequate representation of speech sounds is to use the sounds alone or combined in two letter or three letter nonsense syllables. This device was employed in the classic researches of Fletcher and his associates. It demands, however, careful training in the use of the phonetic alphabet, so that with clinical patients it is out of the question. The next best thing is to use a number of monosyllables commonly found in ordinary conversation. There are enough of these so that one can include all the elementary sounds and combinations of sounds, yet have the words meet the requirement of familiarity to the patient.

Note that polysyllables should not be used, because a "hard of hearing" patient, defective in one frequency region of the speech range but normal in other regions, can often understand a partially unheard word by a psychologic filling-in process. In this case his deficiency would remain undiscovered.

A list of monosyllables has been constructed which fairly meets the requirements of representativeness and of familiarity. These are the so-called Phonetically Balanced (PB) Lists of Harvard University.[11] Twenty lists, of 50 common monosyllables each, were so constructed that each list has about the same total phonetic composition as every other list, and each one was designed to have as closely as possible the same proportions of speech sounds as occur in ordinary conversation. These 1,000 words form an invaluable repository of items for certain kinds of speech reception testing.

11. Egan, J. P.: Articulation Testing Methods, Laryngoscope **58**:955-991, 1948.

These 20 lists were all recorded in this laboratory with high fidelity. In order to sample speech as it is actually heard, each list was recorded by the male spoken voice, the female spoken voice and the female whispered voice. Four males and four females were used. These 60 records form a basic library for phonograph speech reception testing.

Our first concern was whether the phonetically balanced (PB) monosyllables did sample hearing at frequencies above those necessary for understanding the spondees. If this were not the case, the PB lists would have no superiority whatever over the spondee records of Hudgins and associates, which are otherwise ideal.

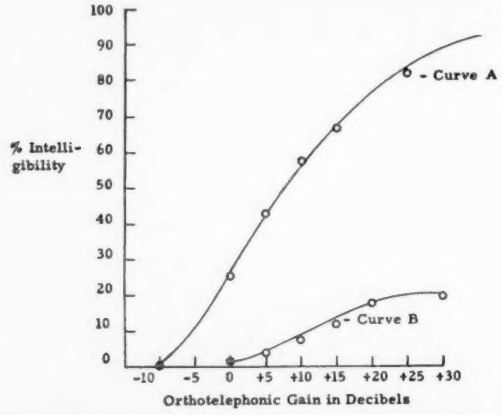

Fig. 6.—This chart shows inability to understand phonetically balanced (PB) lists with extreme simulated high tone deafness. *A*, articulation curve of PB list 1, recorded in this laboratory and presented by phonograph to 12 normal-hearing subjects. The same white noise was mixed with the speech as in figure 5. *B*, articulation curve of the same record, presented to another group of 12 subjects. The same intensity of white noise and the same filter were inserted as in figure 5. NOTE: White noise is mixed with the speech because the filter used does not discriminate infinitely. A 45 decibel differential exists between frequencies passed and those suppressed. White noise effectively eliminates these unwanted frequencies from the problem.

The following experiment clearly demonstrates the superiority of the PB lists on this point. Several spondee lists and several PB lists were recorded in one session, using the same voice, the same voice intensity and the same recording amplifier setting. Each record was then played to one of several groups of 12 men each, either with or without a 1,000 c.p.s. filter in the circuit. Results for the spondees have already been presented in figure 5. Results for the PB lists are presented in figure 6. Curve *A* shows the articulation function

before filtering, while curve *B* shows the function after filtering which simulates complete deafness above 1,000 c.p.s. Figure 5 shows that such simulated deafness reduces spondee intelligibility by only 25 per cent, while figure 6 shows that the same deafness reduces PB intelligibility by 80 per cent.

Thus it is clear that the PB lists do sample speech sounds in the higher frequency regions.

Our second concern was whether, by rerecording, the desirable feature of homogeneous intelligibility could be obtained as well for the PB lists as for the spondees. For this purpose we wish to compare the two types of material with respect to the slope of the articulation curve.

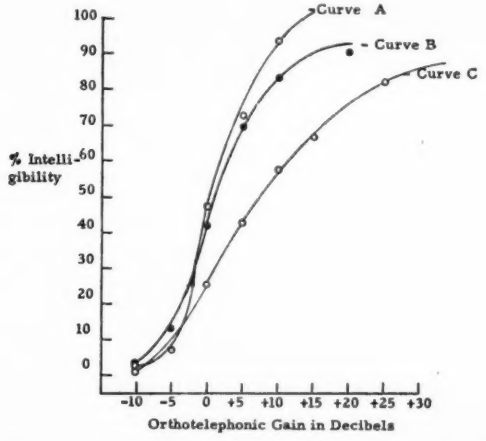

Fig. 7.—This chart shows that rerecording for homogeneous intelligibility can render a list of words about as homogeneous as a list of words preselected for that characteristic. *A*, articulation curve of spondee list 1 A, recorded in this laboratory. *B*, articulation curve of PB list 1, rerecorded for intelligibility. *C*, articulation curve of PB list 1, from which the record of curve *B* was derived.

It will be recalled from figure 2 that the steeper the slope, other things being equal, the better the test for speech reception.

A selection of PB records was analyzed, record by record and word by word, for relative intelligibility. Rerecordings were then made, making poorly intelligible words louder and easily intelligible words weaker, so that a closer central tendency was achieved. These records were then presented to new groups of normally hearing subjects, and the success of the rerecordings was assayed.

It appears that the rerecording process is distinctly of value in rendering a list of words more homogeneous in intelligibility. Figure 7 shows

for a typical list the change in slope of the articulation function before and after rerecording. The steepness of the slope comes to approach that of the spondee records, also reproduced in figure 7 for comparison. Thus the time and the effort spent are justified.

The technic by which these records may be used for speech reception testing is exactly that described by Hudgins and associates for the spondees. A carrier sentence, "Number 1 is . . . .," "Number 2 is . . . ." precedes every word. Seven seconds elapse between items, during which the patient writes or speaks the test word. After every tenth word, 5 decibels of resistance are introduced so that the next 10 words are 5 decibels weaker. A test tone is cut on the record so that with a voltmeter the examiner can assure himself that the intensity level is constant for successive tests. The level at which several normal subjects miss half of the 10 words at that level can be found, and any patient's loss can easily be expressed as the number of decibels by which his hearing of speech differs from that normal standard.

It is to be hoped that some of the PB lists, suitably rerecorded and standardized, may one day be commercially available. The labor involved in recording one or two lists, determining the relative intelligibility of each word and rerecording, is not great if the help of a recording studio or a local radio station is enlisted, as can often be the case. Such records, the precision of which could be depended on even when they are in the hands of a nonmedically trained assistant, would be a welcome adjunct to the armamentarium of the busy otologist.

SUMMARY AND CONCLUSIONS

This paper on the testing of speech reception is designed to assist the clinician who wishes to supplant the unreliable free voice examination with one of the newer tests using the helpful tools of electronics.

In the traditional free voice test the most distressing source of unreliability is the random fluctuation of over-all speech intensity. Directions are given for controlling this variable with a handy portable instrument, the sound level meter, and for reporting hearing deficit in terms of decibels below normal, rather than in terms of the relatively meaningless distance fraction.

A further modification, which inserts a high fidelity communication system between tester and patient, is described. Its advantage is that the tester monitors his voice and need speak at only one level throughout. Very loud and very weak speech are produced by amplification and attenuation.

A fallacy of the monitored live voice test is shown, in that equal intensity of two words at a meter is not necessarily the same thing as equal intelligibility at the brain. Yet equal intelligibility of test words

is one of the two most desirable characteristics of a word list for speech reception testing.

Equal intelligibility can be achieved by selecting words to that end. The best speech reception test so far available, that of Hudgins and his colleagues, offers a set of phonograph records with words of extremely homogeneous intelligibility. It is shown, however, that these words lack another necessary characteristic for an ideal test: They are not representative of speech sounds. They can, indeed, be heard quite well by a patient with serious hearing deficit in the upper half of the speech frequency range. They may therefore be considered to test speech acuity only in the lower speech registers.

The twenty Harvard Phonetically Balanced Lists, of fifty monosyllables each, on the other hand, fairly meet the requirement of representativeness. But the words within each list are inherently very different in intelligibility. The two requirements considered here, of representativeness and of homogeneity of intelligibility, can, however, be secured. A phonetically balanced list, which meets the first requirement, may be treated in rerecording technic so that the second requirement likewise is attained.

This laboratory has prepared a number of such records, and offers directions for and testimony to the worth while nature of the technic.

Mr. C. K. Myers supervised the recording and collected all data reported here.

VIRUS VACCINE IMMUNIZATION AGAINST THE COMMON COLD

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AND
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CHICAGO

THE IDENTIFICATION of the various types of infections of the upper respiratory tract is difficult, because complete bacteriologic differentiation is not yet possible. Definition through establishment of clinical criteria is even more difficult, since objective signs and subjective symptoms are unreliable guides.

Dingle [1] has identified two types of the common cold which are distinct entities: the one, a coryzal type, with an incubation period of one to two days, and the other, a pharyngeal type, with an incubation period of three to nine days. However, he stated that "without knowledge of the incubation periods, the illnesses in a few of the volunteers in each group could not have been differentiated with certainty."

We have not been able to differentiate either spontaneous or induced colds on the basis of clinical characteristics or incubation periods. During the same epidemic, and in the same household, we have noted mild symptoms in some members of a family and severe symptoms in others. We have also noted that usually the person who suffers from severe cold symptoms does so consistently for a period sometimes of several seasons and then enters a period during which he has fewer and milder colds, a pattern apparently indicating a change to the hypoallergic state. Attempts to differentiate the common cold from true influenza on the basis of symptoms, that is, severity and complications and the like, have not been reliable, because a severe cold frequently has the same clinical pattern as influenza.[2] It must be kept in mind that other investigators have reported influenza-like epidemics in which they have been unable to demonstrate the virus of either the A or the B type of influenza.[3]

From the Department of Otolaryngology, University of Illinois College of Medicine, and the Otolaryngology Service, Children's Memorial Hospital.

1. Dingle, J.: Experimental Studies of the "Common Cold" in Human Volunteers, Tr. & Stud., Coll. Physicians, Philadelphia **15**:113, 1947.

2. Smillie, W. G.: Symposium on Infections of the Respiratory Tract, New England J. Med. **223**:651, 1940.

Illustrative of the differences in colds induced by the same agent are the variable results noted in one of our transfer experiments. Six volunteers were inoculated intranasally with chorioallantoic fluid from chick embryos, in which nasal washings from a subject with a mild cold had been propagated for forty-eight hours. One volunteer, with old intrinsic asthma who was selected for her high susceptibility to colds, had a chill within six hours, with development of a very severe infection of the upper respiratory tract, terminating in bronchopneumonia. This patient's illness was ushered in by a high fever, chill and general body aches and pains, symptoms attributed to influenza. In a second volunteer, also with a rather severe perennial nasal allergic condition and a high susceptibility to colds, there developed a very severe infection of the upper respiratory tract, which progressed to purulent sinusitis, but which was also ushered in by increased temperature, chills and general body pains, such as occur in influenza. His symptoms had their onset within twelve hours after inoculation. Two volunteers, also susceptible to colds, had very mild colds, without a rise in temperature, after twenty-four hours, but recovery was uneventful within five and six days, respectively. The third pair of subjects, inoculated with the same material, did not have colds.

We have found, as have others, that there is a general tendency for colds to occur in epidemics of varying patterns, although they may occur sporadically throughout the cold months. Except when secondary infection occurs, the common cold lasts from four to six days. It can be transmitted to volunteers during any period of its course, although more "takes" occur during the first twenty-four to forty-eight hours. Little faith can be placed in a patient's account of a cold. The diagnosis must be made by a competent observer, who is able properly to examine the nose and throat and evaluate the physical findings. This is especially important because so many cold-susceptible patients also suffer from attacks of hyperesthetic rhinitis, the symptoms of which simulate an early cold.

We have made careful subjective and objective studies of colds during every epidemic since 1932. From these studies we have pieced together a general pattern of symptoms and signs to guide us in the identification of this disease. The common cold may begin with either

3. (*a*) Reiman, H. A., and Stokes, J., Jr.: An Epidemic Infection of the Respiratory Tract in 1938-1939, Tr. A. Am. Physicians **54**:123, 1939. (*b*) Allen, W. H.: Acute Pneumonitis, Ann. Int. Med. **10**:441, 1936. (*c*) McKinlay, C. A.: Acute Diffuse Bronchiolitis with Report of a Case, Journal-Lancet **50**:90, 1939. (*d*) Reimann, H. A., and Havens, W. P.: An Epidemic Disease of the Respiratory Tract, Arch. Int. Med. **65**:138 (Jan.) 1940. (*e*) Magill, J. T.: A Virus from Cases of Influenza-Like Upper Respiratory Infection, Proc. Soc. Exper. Biol. & Med. **45**:162, 1940.

pharyngeal or nasal symptoms. When it begins in the pharynx, the patient complains of a dry, painful sensation high up in the pharyngeal vault. Examination of this area by direct view reveals acute inflammation of the mucosa. At this stage there is some general lassitude but usually no fever or cough. These symptoms last twenty-four to forty-eight hours, after which the infection moves either into one side of the nose or into the oropharynx. When the nose becomes involved, the patient has a headache, usually on the same side as the nasal involvement, the nose becomes stuffy and there is present a feeling of irritation. Examination of the nasal mucosa reveals the signs of acute inflammation. After twelve to twenty-four hours, the opposite side of the nose becomes involved, a watery discharge is present and excoriation of the skin of the nasal vestibule and the upper lip occurs. These symptoms last about three days, when the cold terminates, unless the infection spreads into the sinuses. This complication occurs in persons whose local resistance to the virus is low—for example, the allergic person with hyperplastic changes throughout the upper respiratory tract. When the sinuses first become involved, there is usually severe headache, and the nasal discharge still appears watery. After the second or third day, however, definite secondary infection occurs, and the discharge becomes purulent. There then develop the symptoms associated with acute purulent sinusitis—nasal discharge; pain and tenderness over the sinuses; postural headache; pharyngeal cough due to the postnasal drip, particularly during sleep, when the material accumulates in the pharynx; some rise in temperature, and an increased white cell count. The severity of the latter symptoms depends on the number of sinuses involved. On the other hand, the infection may begin in the pharyngeal vault and move down the respiratory tract without involving the nose or sinuses. In these cases cough is an early predominant symptom and is often associated with hoarseness when the larynx becomes involved. In most cases the infection is arrested in the larynx, the entire cold lasting from four days to a week. In other cases the virus infection may move down into the chest, resulting in virus pneumonitis. Secondary invaders may overgrow anywhere along the area, resulting in a purulent infection of the pharynx, larynx, bronchi or lungs.

The common cold may begin in the nose instead of the pharynx, secondarily infecting the sinuses and the lower respiratory tract. The symptoms and complications differ in no way from infections which are primary in the pharynx. Both types are seen in the same epidemics, and even in members of the same families. We have transferred the nasal type to human volunteers and have had primary pharyngeal infections develop. We, similarly, have transferred material originally obtained from patients who initially had pharyngeal symptoms and have had the initial symptoms develop in the nose.

Some clinicians[4] have observed a similarity in pattern in each epidemic of colds, suggesting that a common virus agent is active in each epidemic. However, it would seem that the severe symptoms and complications noted in human subjects are associated with overgrowth of respiratory bacteria prevalent at the particular time that the virus epidemic occurs. Smillie[2] found Pneumococcus type XIV prevalent in an orphan home without serious consequence until an epidemic of colds invaded the nursery. The pneumococcus increased in prevalence in infections of the throat and ear, and pneumonia occurred. Pneumococci of type XIV were isolated from the ears and the sputum. Every rhinologist is familiar with the patient suffering from hyperplastic sinus disease who invariably has to seek help after the second week of a cold because of suppuration in the sinuses.

It is normal for persons to have one or two colds during the year. However, the sufferer from colds who seeks help from the physician is likely to have four or more colds yearly, each cold occurring during one of the numerous cycles of virus colds which occur almost monthly throughout the year. Not infrequently, particularly in children, these colds are so numerous that the patient continuously has a suppurative pansinusitis, which represents the residuum carried over from one cold to another. Such patients, it must be remembered, are physically normal, but if their noses are examined hyperplastic changes are found, indicating an allergic state. Our belief that patients with frequent colds are allergic rests on the further evidence of other allergies in the person and in his family, as well as on the evidence obtained by a survey with foreign proteins.

It must be appreciated, therefore, that of the numerous factors which predispose persons to colds, allergy is probably one of the most important—a factor long overlooked because the condition is not evaluated properly during the formative stage. Unless the allergic state is eradicated, immunization to colds will continue to be a failure.

A cold should be considered as an allergic response to stimulation by a specific protein, which in this instance is the cold virus. In order to hyposensitize the patient successfully, one must consider factors similar to those noted in hyposensitizing persons to other air-borne allergens. The virus is carried in air droplets over distances of fully 30 to 40 feet (9 to 12 meters)[5] after a cough or sneeze. One can readily understand that in a crowded room, or in an atmosphere highly impregnated with virus allergen, inhalation by a virus-hypersensitive person can lead to an allergic response or a cold.

4. Smillie.[2] Brennemann, J.: Throat Infections in Children, Arch. Pediat. **42**:145, 1928.

5. Wells, W. F.; Stokes, J., Jr.; Wells, M. W., and Wilder, T. S.: Experiments in the Environmental Control of Epidemic Respiratory Infection, Tr. & Stud., Coll. Physicians, Philadelphia **7**:342, 1940.

In a series of 3,000 patients whom we have attempted to immunize to the common cold, over 80 per cent have been proved to be allergic or from an allergic family. Other observers have noted the incidence of colds in allergic persons. Cohen,[6] in a series of 35 children under 12 years, found that 23 per cent suffered from frequent colds, with sinusitis a major complaint. Sternberg[7] noted a loss in susceptibility to colds during the winter after a course of specific pollen therapy. He also cited Cooke's statement that 36 of 53 patients who had frequent colds were relieved after pollen therapy. The 17 who were not relieved also did not obtain relief from the hay fever. Fox, Harned and Peluse[8] reported that in a series of over 1,200 sufferers from frequent colds, 80 per cent were proved to be allergic by the personal and family histories and by skin tests.

The most important accidental factor in infections is trauma. Immunologically speaking, in an allergic response the union of antigen and antibody in the cells results in injury and release from the cell of a preformed histamine-like material. So the stage is set in the nasal mucosa of the allergic patient, through the continuous bombardment by foreign proteins causing injury by the release of H-like materials and the production of a locus minoris resistentiae. It is conceivable, also, that a specific hypersensitivity to the virus protein might exist.

The part played by lowered general resistance, debility or exposure is questionable when one notes a normal incidence of colds in institutions for tuberculous persons or in those having other chronic diseases. On the other hand, inhabitants of Spitzbergen have practically no colds, although most of them, being fishermen, are frequently immersed.[9] However, when a cargo ship arrives, about 80 per cent of the townsfolk contract colds. It may be said that physically normal persons who exhibit a tendency to frequent colds suffer from an allergic state and, vice versa, that the allergic patient frequently suffers from numerous colds.

PRESENT STUDY

The patients selected for study were those who had had four or more colds a year for a period of at least two years. A careful physical examination was made, with particular emphasis on pathologic condi-

6. Cohen, A. I.: Allergy and Its Relationship to Sinusitis and Allied Nasal Conditions, Arch. Otolaryng. **21**:265 (March) 1935.

7. Sternberg, L.: The Effect of Pollen Infections on the Common Cold in Hay Fever Subjects, J. Allergy **6**:304, 1935.

8. Fox, N.: Harned, J. W., and Peluse, S.: Borderline Allergy: Its Relation to Hyperplastic Disease of the Respiratory Tract, Arch. Otolaryng. **31**:502 (March) 1940.

9. Paul, J. H., and Freese, H. L.: Epidemiological and Bacteriological Study of the Common Cold in an Isolated Arctic Community (Spitzbergen), Am. J. Hyg. **17**:517, 1933.

tions of the ear, nose and throat. A history was obtained as to the presence or absence of any clinically recognizable allergy, past or present, in the patient and his family. His subsequent course was then followed by reexamination, letter and telephone communication.

Method.—This investigation had its inception in 1930-1931 in the allergy section of the department of otolaryngology of the University of Illinois College of Medicine.[10] Since 1940 it has been extended to include a parallel study conducted at the Children's Memorial Hospital. Because we had a large group of persons with sinobronchitis and asthma of the intrinsic type who failed to react either to autogenous or to stock vaccines made from nasal washes and sputums, an effort was made to find other materials that might benefit them. With the knowledge that most immune bodies are found in the pseudoglobulin fraction of the blood and that the nasal tissues might be the reservoir for this material, this fraction was obtained from human nasal mucosa harvested during various nasal operative procedures. Since this material was limited in quantity and its use seemed promising in a small number of patients, we looked about for large sources of nasal tissues which might not be too antigenic, but still be easily obtainable. A survey among experts in animal husbandry elicited the information that hogs are probably more resistant to ordinary infections of the upper respiratory tract, other than tuberculosis, than any other common food animal. This opinion was based on the observation that hogs rarely exhibit a purulent nasal discharge. A visit to a local slaughter house corroborated this information. We found pus in only 8 of the sinuses of 500 hog heads examined. On the other hand, almost one third of a like number of sheep showed evidence of sinus infection. Our work, thereafter, centered about the effect of hog pseudoglobulin extract. Three groups, consisting of 90 patients each, were immunized. To the first group a 1:20,000 solution of hog pseudoglobulin was given; to the second group, a 1:20,000 solution of hog euglobulin, and to the third, a 1:20,000 solution of serum albumin, the last two groups being used as controls. The injections were started with 0.1 cc. and increased by 0.1 cc. every fourth day until twenty injections, corresponding to a total amount of 2.0 cc., were given. Briefly, our results revealed that 70 per cent of the patients showed definite improvement with pseudoglobulin therapy, while the degrees of improvement with euglobulin and serum globulin were about the same, namely, 10 per cent.

The unusual observation was made, however, that 30 per cent of the patients receiving pseudoglobulin were free of colds for four months or longer. As a result of this finding, we determined to try to fortify our pseudoglobulin solution, since the reduction of colds definitely produced improvement in those persons whose symptoms were aggravated by colds, particularly by the residual sinus infection remaining after a cold. In order to fortify the pseudoglobulin solution, we added material collected from persons during the first forty-eight hours of an active cold. Our method of collection was to wash out the nose during the first twenty-four to forty-eight hours of a cold with 30 cc. of a 1:20,000 solution of hog pseudoglobulin with the patient placed in the Proetz position. This material was passed through a Seitz filter and frozen in the ordinary refrigerator. Material was collected for three months and pooled. It was then treated with a

10. Fox, N., and Harned, J. W.: Use of Extract of Nasal Mucosa in Treatment of Acute and Chronic Rhinosinusitis: Preliminary Report, Arch. Otolaryng. **24**:89 (July) 1936.

dilute solution of formaldehyde U. S. P. (0.36 per cent). Each patient received five doses, given at four day intervals. The first dose was 0.2 cc. and was increased by 0.2 cc. until 1.0 cc. was given. Two hundred and fifteen patients were immunized, of whom 66 had an immunity lasting six months or more. We reasoned that this high percentage of failures must have been due either to an insufficient quantity injected or to failure to obtain all agents responsible for the cold. We then collected materials throughout the year in the same manner as previously described and pooled the entire year's harvest. We further increased the number of injections for adults to ten, each injection being increased by 0.2 cc. every fourth day until 2.0 cc. had been given. To children we gave ten doses, with increases of 0.1 cc. every fourth day until 1.0 cc. had been given.

Of the 478 patients who were immunized with this material, 286 obtained an immunity lasting six months. Because the formalized material was very painful, we tried killing the virus by heating to 48 C. for one hour and using 0.4 per cent phenol or 0.3 per cent cresol for preservative. Of the 277 patients immunized with this material, 159 obtained an immunity of six months or longer. This result was about the same as that obtained with the formalized material. Sixty-five patients were treated with 2 per cent alum-precipitated material, but this vaccine was ineffective. A series of 60 patients were treated with virus material combined with the usual catarrhal vaccine, which contained Streptococcus hemolyticus, pneumococcus, Klebsiella pneumoniae (Friedländer's bacillus), Staphylococcus aureus and members of the Streptococcus viridans group. This material was no more effective than the virus material alone. For the past six years, all human material has been made up in Coca's buffered saline solution.[11] With this material we have immunized an additional 640 patients, 390 of whom obtained six months of immunity to colds. In all, we have immunized 1,755 patients with material collected directly from persons during the acute stage of a cold.

In 1937 we began propagating cold virus in the chorioallantoic fluid of the chick embryo, following the report of Dochez, Mills and Kneeland.[12] From that time, our materials have been of two types: the type pooled from human colds and used directly after being made up in Coca's solution, and the material harvested from eggs. Since we had worked up considerable interest among our cold-susceptible patients, it was an easy matter to collect virus and immediately inoculate prepared eggs. Because we had no way of identifying the virus, material was taken from every epidemic outbreak. The chick fluid was harvested after twenty-four to forty-eight hours of incubation and pooled at the end of the year. Appreciating the danger of possible sensitization to egg albumin, we diluted our material ten times with Coca's solution. This material we injected as we had the human material, giving ten doses at four day intervals, starting children with 0.1 cc. and increasing the injections by 0.1 cc. each time until 1.0 cc. had been given. Adults were started with 0.2 cc., and the dose was increased by 0.2 cc. every fourth day until 2.0 cc. had been given.

Under existing conditions, one might suppose that the presence of a viable virus might produce colds in many patients. Actually, about 60 per cent of the patients had colds during the period of injection. However, as this period was over five weeks, it represented a length of time during which the patients would

11. Vaughan, W. T.: Practice of Allergy, St. Louis, C. V. Mosby Company, 1939, p. 271. Coca's buffered saline solution contains 0.5 per cent sodium chloride, 0.275 per cent sodium bicarbonate and 0.4 per cent phenol, as a preservative.

12. Dochez, A. R.; Mills, K. C., and Kneeland, Y.: Studies on the Common Cold, J. Exper. Med. **63**:559, 1936.

normally have had a cold. We also found that there was a period of from four to six weeks after the injections were finished during which the patient was likely to get a cold.

Up to two years ago, we had immunized 1,120 patients with this material, obtaining an immunization of six months or better in 664 patients. During the past two years, we have prepared our material after the method of Cox and associates,[13] who concentrated and purified influenza virus by precipitation with alcohol. They demonstrated that methyl alcohol would precipitate influenza virus from infected chorioallantoic fluid and that the optimum concentration of alcohol necessary was 25 to 30 per cent. Briefly, the method is as follows:

Methyl alcohol is added to the allantoic fluid gradually, while the temperature is lowered to 5 C., until a 25 to 30 per cent mixture is obtained. This is allowed to stand for three hours and is then centrifuged at 3,500 revolutions per minute for thirty minutes. In the Cox method, the precipitate is suspended in one-half the original volume of 0.1 molar phosphate buffer solution of p_H 7.0 and is allowed to stand at room temperature for one hour. However, we suspended the material in one-half the original volume of Coca's solution and allowed it to stand at room temperature for one hour. The suspension was then centrifuged at 2,000 revolutions per minute for fifteen minutes at room temperature and placed in the refrigerator for storage until used. With this material we immunized 340 patients, of whom 211 had an immunity to colds for six months.

From time to time, sample harvests were injected or sprayed into the noses of volunteers in order to test for viability of the virus. Over a period of sixteen years we have transferred colds successfully to over 100 volunteers. Some observers have reported characteristic findings produced in volunteers inoculated with cold virus. This has not been our experience. When selecting as volunteers subjects who were susceptible to colds, we noted that the percentage of "takes" ran as high as 75 per cent, some subjects responding with symptoms more or less violent than the donor's. On the other hand, selection of persons not particularly susceptible as volunteers elicited only about 20 per cent of "takes," and frequently these were milder than the donor's cold.

In immunizing a subject to hay fever, a minimum of fifteen injections is usually necessary. Most physicians, when using the perennial method, give about forty injections throughout the year preceding the allergic season. Yet, the hay fever season rarely lasts more than two or three months. On the other hand, the season of colds lasts about ten months, and successful immunization must last over this entire period. Obviouly, a small number of injections cannot afford adequate protection for so long a time. We give a total of ten injections, usually increasing each injection by 0.2 cc. every fourth day until 2 cc. of material is given. However, when unsuccessful, we add another ten doses, beginning again with 0.2 cc., with increases up to the final dose of 2 cc. Ordinarily, we get an immunity of six months from ten doses in about 60 per cent of our patients. An additional ten doses after three months will give a longer immunity. Unfortunately, few patients will submit to so much treatment merely to prevent colds. On the other hand, while a number of patients did experience specific local reactions, none of the 3,000 patients studied suffered an immediate general reaction.

Immunization through the use of nasal tampons soaked in vaccine is being carried out but at present our series is too small to permit proper evaluation of this method.

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13. Cox, H. R.; van der Scheer, J.; Aiston, S., and Bohnel, E.: The Purification and Concentration of Influenza-Virus by Means of Alcohol Precipitation, J. Immunol. **56**:149, 1947.

It is questionable whether a suspension of cold virus can be used intracutaneously as a test of susceptibility or immunity to colds. It would be desirable to use a test of this sort as an index of susceptibility, as well as a means of determining the dose of material necessary for protection against colds. The effort made toward this end was briefly as follows:

Material for testing was obtained from each epidemic throughout one year in the following manner: At each epidemic, patients with early colds, i. e., of from twenty-four to forty-eight hours' duration, were placed in the Proetz position and their noses perfused with 30 cc. of sterile distilled water. Usually six to ten

Results of Treatment of Common Cold by Use of Virus Vaccine

Source	Preservative Killing or Attenuating Agent	Menstruum	Number of Patients Given Injections	Patients Successfully Immunized for 6 Months		Number of Injections per Patient
				No.	Percentage %	
Human	Dilute solution of formaldehyde U. S. P. (0.36%)	Nasal washings collected for 3 mo. in hog pseudoglobulin solution 1 : 20,000	215	66	30	5
Human	Dilute solution of formaldehyde U. S. P. (0.36%)	Nasal washings collected for 12 mo. in hog pseudoglobulin solution 1 : 20,000	478	286	59	10
Human	Heated to 48 C. for 1 hr., 0.4% phenol or 0.3% cresol	Nasal washings collected for 12 mo. in hog pseudoglobulin solution 1 : 20,000	277	159	58	10
Human	2% alum-precipitated phenol 0.4%	Nasal washings collected for 12 mo. in hog pseudoglobulin solution 1 : 20,000	65	10	15	10
Human	Heated to 48 C. for 1 hr., 4% phenol	Nasal washings in pseudoglobulin solution and organisms of respiratory tract	60	34	56	10
Human	Phenol	Nasal washings in pseudoglobulin solution made up in Coca's solution	640	390	61	10
Chick	Phenol	Nasal washings in pseudoglobulin solution diluted 10 times in Coca's solution	1120	664	59	10
Chick	Phenol	Methyl alcohol-precipitated concentrate 2 times in Coca's solution	340	211	62	10

specimens were collected from each epidemic. This material was then passed through a Seitz filter and the filtrate concentrated to one-tenth its volume in a vacuum still. Phenol was added as a preservative. The underlying assumption was, of course, that, although there is a multiplicity of viruses, the material would include the one type of virus responsible for that particular epidemic; the materials from each epidemic were therefore kept separate. Except for the 0.4 per cent of phenol in the solution, no special inactivation of the material was attempted.

The testing was done by injecting intradermally 0.05 cc. of the material into the volar surface of the forearm.

While almost all subjects experienced some degree of positive reaction to the cold virus material, many showed a very decided reaction. Some displayed a definite reaction to one material and no reaction to other

materials. It is possible that the reaction in each case was determined by exposure to a strain of virus to which the individual subject was specifically susceptible. Frequently, a good positive reaction would be seen in a patient who gave a history of having had a cold during the epidemic from which the material was collected.

Recent reports by Pollard and Caplovitz [14] and Topping and Atlas [15] on propagation of cold virus in chick embryos and attempts at immunization to colds give further evidence supporting the results of the present study.

COMMENT

The limitations of such a study and the many chances of error in interpretation of results have been fully appreciated and, so far as possible, eliminated. Primarily, the study has been hampered by the lack of supportive laboratory experimentation.

We have had to collect washings empirically from patients during each cold epidemic, so that we do not know how frequently we have duplicated our material. In some epidemics this material may have been obtained from 50 persons, and in others the number from whom washings were obtained may have been only 10.

By collecting material over a period of a year, we felt that at least a major number of the multiplicity of strains of cold virus would be isolated. Obviously, if we have missed some strains, our material will not be completely protective. Magill and Francis,[16] in a study of twenty-four strains of influenza virus, showed that there is a striking variation in antigenic characteristics of the different strains. They suggested that the structure of the virus of epidemic influenza is a mosaic of antigens and that each strain does not contain all, or even a major part, of the antigenic components of other strains. The same reasoning is probably applicable to the various virus strains of the common cold; it also suggests that, in order to be efficacious, a vaccine must include the viruses of all the diseases of the upper respiratory tract.

It has not been possible to develop neutralization tests or specific immunologic reactions to cold virus either in human subjects or in animals. Cutaneous tests, while frequently giving positive reactions, have failed to produce any dependable factor of correlation. Certain clinical pitfalls also have had to be recognized and avoided. Our patients were selected because of their susceptibility to colds which we

14. Pollard, M., and Caplovitz, C. D.: Experimental Studies with the Agent of the Common Cold, Science **106**:243, 1947.

15. Topping, N. H., and Atlas, L. T.: The Common Cold: A Note Regarding Isolation of an Agent, Science **106**:636, 1947.

16. Magill, T. P., and Francis, T., Jr.: Antigenic Differences in Strains of Epidemic Influenza Virus: Gross Neutralization Tests in Mice, Brit. J. Exper. Path. **10**:273, 1934.

had personally observed either in our clinics or in private practice. However, because some reports of the results of vaccination were frequently made by telephone or postal communication, we had at times to depend on the testimony of the patient. In about 20 per cent of the patients who had apparently benefited by the inoculations the improvement coincided with a successful course of specific allergy hyposensitization. In others, the possibility that a natural immunity to colds had normally developed had to be discounted. This problem was dealt with by giving a course of placebo injections with isotonic sodium chloride solution, after several successful years with cold virus. Those who reverted to their previous susceptibility to colds after the placebo course were then judged to have been helped by the inoculations of cold virus.

The situation was further complicated when attempts were made to estimate the duration of the protection. In most of the successful cases immunity to colds lasted at least one season. Our criterion for a successful immunization was, however, that of a six month period. About 60 per cent of the adults and 65 per cent of the children immunized met this criterion. In many of the unsuccessful cases only one or two colds occurred throughout the six month period, so that, on the basis of the previous two year record of four or more colds per year, this might have been interpreted as an improvement of 50 per cent or better. However, these cases were tabulated as failures. It has been pointed out in this and other studies that the person who has frequent colds has a history of other allergies in himself and in his family. It has also been shown that allergic patients invariably suffer from hyperplastic changes in the upper respiratory tract, particularly the pharynx, nose and sinuses. Obviously, allergic tissues are more easily injured by virus than are normal tissues, so that part of the program in the prophylaxis against colds should include a careful foreign protein survey and immunization to other offending allergens, as well as the use of chemotherapy for prevention of secondary infection.

CONCLUSIONS

Persons who suffer from frequent colds are allergic.

There is considerable evidence to support the contention that the common cold is, at its onset, an attack of acute allergic rhinitis, with the protein of cold virus acting as the exciting agent.

The results of this study also offer evidence that some persons can be successfully hyposensitized with cold virus and remain protected from colds for at least six months.

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USE OF RADIUM IN TREATMENT OF HYPERTROPHIC LYMPHOID TISSUE IN THE NASOPHARYNX

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INCOMPLETE surgical removal is not the only cause of the recurrence of lymphoid tissue in the nasopharynx following adenoidectomy. Even though all visible and palpable areas of adenoid tissue are carefully removed, there may remain seeds of lymphoid tissue in the mucous membrane of the nasopharynx which may increase in size, leading to deafness, chronic pharyngitis, chronic postnasal discharge and otorrhea.

During the past ten years radium has been found to be useful in destroying recurrent lymphoid tissue in the nasopharynx. However, the dose of radiation has not been definitely established.

The aims of this paper are: (1) to present a picture of radium therapy as applied to the nasopharynx, including the anatomic, pathologic and physical principles involved; (2) to show the therapeutic indications for the therapy; (3) to outline the therapeutic technic; (4) to compare the results in a short series of cases in which the monel metal® 50 mg. radium sulfate applicator was placed eight and one-half minutes to each side of the nasopharynx with the results in a similar series of cases in which the same applicator was placed twelve minutes to each side of the nasopharynx; (5) to demonstrate that the longer, twelve minute, treatment can safely and more effectively destroy recurrent lymphoid tissue.

HISTORY

In 1939 Crowe and Baylor [1] reported beneficial effects of the application of 2 gram-minute doses of radon to each side of the

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Thesis submitted to the faculty of the Graduate School of Medicine of the University of Pennsylvania in partial fulfilment of the requirements for the degree of Master of Medical Science (M.Sc. [Med.]) for graduate work in otolaryngology.

1. Crowe, S. J., and Baylor, J. W.: The Prevention of Deafness, J. A. M. A. **112**:585 (Feb. 18) 1939.

nasopharynx to prevent deafness. They pointed out that 40 per cent of children in the 8 to 14 year age group have a hearing impairment for some or all tones above c-4 (2,048 cycles per second). Large adenoid or lymphoid nodules near the nasopharyngeal orifice of the eustachian tube interfere with normal ventilation of the middle ear. In contrast to the generally accepted idea of the effect of chronic catarrhal otitis media in impairing hearing for low tones, adenoids impair hearing for high tones.

In 1943 Fricke and Pastore[2] reported successful treatment of lateral pharyngeal bands with radium irradiation.

Recently Ward and co-workers[3] reported the use of radon in the treatment of asthma in children. Because of the shortage of hospital beds in 1940 and 1941, many children who required adenotonsillectomy were sent to the Radon Clinic of the Johns Hopkins Hospital for irradiation of the nasopharynx. In 1941 Ward observed a decrease in severity and frequency of attacks of asthma in children who were so treated. Follow-up studies confirmed his observation.

During World War II radium was used by the Army Air Forces to prevent and relieve recurrent aero-otitis in flying personnel.[4]

ANATOMY

The recurrent lymphoid masses may occur (1) centrally, in the midline of the pharyngeal vault, producing nasal stuffiness; or (2) laterally; (*a*) about the torus tubarius and within the eustachian tube, (*b*) in Rosenmüller's fossa, (*c*) as lateral pharyngeal bands and (*d*) as granular pharyngitis.

Hyperplasia of the lymphoid tissue is not always associated with clinical symptoms. The production of symptoms depends on the presence of infection and/or an abnormal size and shape of the nasopharyngeal vault. The lymphoid tissue of the nasopharynx may be the only structure in Waldeyer's ring presenting hyperplastic changes.

Small nodules of lymphoid tissue in Rosenmüller's fossa, about the pharyngeal orifice of the eustachian tube or in the area between the tubal orifice and the posterior end of the middle turbinate body, may seriously impair the ventilating function of the eustachian tubes.[5] The

2. Fricke, R. E., and Pastore, P. N.: Radium Treatment of Granular or Hypertrophied Lateral Pharyngeal Tonsillar Bands, Radiology **40**:256 (Sept.) 1943; abstracted, Proc. Staff Meet., Mayo Clin. **18**:307 (Aug. 25) 1943.

3. Ward, A. T., Jr.; Livingston, S., and Moffat, D. A.: Irradiation Treatment of Asthma, J. A. M. A. **133**:1060 (April 12) 1947.

4. The Use of Radium in the Aerotitis Control Program of the Army Air Forces, Ann. Otol., Rhin. & Laryng. **54**:650 (Dec.) 1945.

5. Harris, H. E., and Montgomery, E. L.: The Treatment of Lymphoid Hyperplasia of the Nasopharynx by Radium, Cleveland Clin. Quart. **13**:117 (July) 1946.

rich content of lymphoid tissue in the mucous membrane of the nasopharynx and the proximity of the nasopharynx to the nasal passages, paranasal sinuses and eustachian tubes make this area of inflammation the primary focus of infection for many complications about the upper air passages.

The lateral pharyngeal bands are linear patches of lymphoid tissue which lie in the most lateral portion of each side of the pharynx, posterior to the pharyngopalatine arch, and usually extend into the salpingopharyngeal fold. Fricke and Pastore [2] divided the lateral pharyngeal bands into three types: (1) fine, granular pharyngeal bands, which are evident only when inflamed; (2) coarse, raised, granular pharyngeal bands, which are chiefly inflamed areas with very few crypts; these bands are a common cause of chronic granular pharyngitis; (3) hypertrophic lateral pharyngeal tonsils or tonsillar bands, which are cryptic, thickened bands, resembling the palatine tonsils, but behind the posterior pillars of the fauces.

Granular pharyngitis consists of multiple islands of lymphoid tissue in the nasopharyngeal and oropharyngeal walls.

Mucous glands are most numerous in the upper part of the pharynx and in the region of the lateral pharyngeal band, where they occur deep beneath the level of the lymph nodules. In chronic inflammation the mucous glands become more conspicuous, owing to the increased number of alveoli. Conspicuous lateral pharyngeal bands are due to hyperplasia of the glandular elements rather than to hyperplasia of the lymphoid tissue.[6] This may account for apparent failures of treatment of lateral pharyngeal bands.

PATHOLOGY

Infections of the upper respiratory tract result in hyperplasia and hypertrophy of the lymphoid tissue in the nasopharynx. Even if the acute symptoms subside without systemic complications, the mechanical obstruction to breathing and to the eustachian tubes, the hypersecretion of mucus and the lowered resistance of the patient predispose to recurrence of the infection or progression to a chronic condition. When the tonsils and adenoids are removed, it is impossible to remove all the lymphoid tissue in the mucous membrane of the nasopharynx. In some children infections continue to recur after adenotonsillectomy, and the posterior and lateral walls of the pharynx become studded with nodules of lymphoid tissue, known as granular pharyngitis. The orifice of the eustachian tube may be occluded by an overgrowth of the lymphoid tissue in Rosenmüller's fossa, around the tortus tubarius or within the

6. Schenck, H. P.: Histopathological Changes Occurring in Chronic Infection of the Pharynx, Ann. Otol., Rhin. & Laryng. **50**:817 (Sept.) 1941.

tube itself. The overgrowth may also extend upward on the anterior surface of the sphenoid bone as high as the level of the middle turbinate body.[7]

When the atmosphere is frequently filled with a heavy concentration of smoke or dust, postnasal discharge is a common complaint. This is the result of the physiologic effect of an oversecretion of mucus and the action of the cilia in moving the mucous blanket to the nasopharynx. Examination by means of the electric nasopharyngscope reveals a mass of hyperemic lymphoid tissue in the nasopharynx, covered with a thick, tenacious discharge. There is also hypertrophy of the mucous membrane overlying the posterior end of each inferior turbinate body.[8]

Most microscopic studies of the eustachian tube and its opening into the nasopharynx had been done on infants or embryos prior to the time that Fowler[9] examined 103 pairs of temporal bones of military personnel killed in the European Theater of Operations during World War II. About one third of his specimens showed tissue protruding from the torus tubarius along both the salpingopharyngeal and the salpingopalatine folds. About one-half showed an abundance of lymphoid tissue on the posterior pharyngeal wall. Microscopically he noted typical lymphoid tissue about the salpingopharyngeal fold. The men who had had radium therapy showed absence of germinal centers and prominence of the endothelium of capillaries. About two thirds of the specimens examined microscopically showed eustachian salpingitis. Lymphoid masses were rare except near the pharyngeal orifice of the tube, but were found anywhere along the tube, and even in the middle ear.

Histologic study of tissue removed from the nasopharynx eighteen to twenty-four hours after a single irradiation showed changes only in the germinal centers of the lymphoid tissue. The mature lymphocytes, the epithelium, the vascular endothelium and all other tissues appeared normal. In the germinal centers, cellular debris and large phagocytes containing fragmented cells were observed. No mitotic figures were seen. Biopsy one week after irradiation showed recovery; mitotic figures were seen again and much of the cellular debris had been removed. These observations indicate that the dose used destroyed only the cells undergoing mitosis at the time of the treatment. This destruction interrupted the normal cycle of replacement of mature lymphocytes. The size of the lymph nodule depends largely on the

7. Crowe, S. J.: The Nasopharynx, Arch. Otolaryng. **33**:618 (April) 1941.

8. Fisher, G. E.: Recognition and Radium Treatment of Infected and Hypertrophied Lymphoid Tissue in the Nasopharynx, Arch. Otolaryng. **37**:434 (March) 1943.

9. Fowler, E. P., Jr.: Irradiation of the Eustachian Tube, Arch. Otolaryng. **43**:1 (Jan.) 1946.

number of mature lymphocytes. These mature lymphocytes are constantly being used up, discarded and replaced by mitosis of the germinal center cells. Properly spaced radium treatments prevent the replacement of lymphocytes and thus cause a gradual and progressive reduction in the size of the lymphoid tissue.[4]

PHYSICAL FACTORS

Three types of rays are emitted by radium preparations: alpha, beta and gamma. A large part of the energy emitted is in the form of alpha rays. These rays have so slight a penetrating power that they are completely absorbed by the monel metal® capsule of the applicator and therefore have no therapeutic value. Beta rays have considerable power of penetrating matter. About 75 per cent of such rays are absorbed in the first 3 mm. of tissue, but 6 or 7 per cent of the beta rays are still present after passing through 20 mm. of a tissue.[10] Beta rays are valuable in treating superficial conditions amenable to radiation therapy. Gamma rays are more likely to cause internal injuries. However, less than 10 per cent of the gamma rays are absorbed. The effects aimed for in and obtained by radiation therapy are entirely dependent on absorption of radiation by the tissues. Rays that pass through the body and are not absorbed have no therapeutic value.[11] With the 0.3 mm. monel metal® filtration used in the Army type 50 mg. radium sulfate nasopharyngeal applicator, the rays emitted consist of approximately 30 per cent beta rays and 70 per cent gamma rays.[4]

THERAPEUTIC INDICATIONS

The first use of radium in the treatment of hypertrophic lymphoid tissue in the nasopharynx was for the prevention or cure of impaired hearing, especially in children. Later, radium irradiation was extended to treatment of recurrent colds with aural or sinus complications, recurrent adenoids, aerotitis, granular or hypertrophic lateral pharyngeal bands, chronic otorrhea and, in selected cases, asthmatic bronchitis.

The first evidence of impaired hearing due to obstruction of the eustachian tubes is loss of hearing for high tones and may escape detection with the usual hearing tests, but as the condition progresses the lower tones are lost, until the conversational range is affected and deafness becomes evident.

Nerve deafness or otosclerosis may be superimposed on conduction deafness due to occlusion of the eustachian tubes. Irradiation is indicated

10. Burman, C. F., and Crowe, S. J.: The Monel Metal Radium Applicator Designed for Maximum Use of Hard Beta Rays in the Treatment of Nasopharyngeal Lymphoid Tissue, Mississippi Valley M. J. **67**:109 (Oct.) 1945.

11. Burman, C. F.: General Factors in Irradiation Therapy, Ann. Otol., Rhin. & Laryng. **55**:764 (Dec.) 1946.

in such cases if lymphoid tissue is found in the nasopharynx. The radium therapy may restore hearing to a more useful level, although nothing is gained so far as the underlying primary condition is concerned.[12]

Crowe [13] pointed out that recurrence of adenoids after operative removal is so frequent that it must be regarded as normal. The recurrence of the adenoids is not always due to incomplete operation, but is to be explained chiefly by the fact that lymphoid tissue is an integral part of the mucous membrane of the posterior and lateral walls of the pharynx and that in some children it hypertrophies as a result of infection, allergy and other causes, not understood.

Adenoids should not be removed in patients with cleft palate. Many children, after a successful operation for cleft palate, acquire a normal

TABLE 1.—*Distribution of Patients According to Therapeutic Indications**

	Percentage of All Patients (74)	Duration of Treatment: 8½ Min. (41 Patients) No.	%	12 Min. (33 Patients) No.	%
Age					
Children	34	16	39	9	27
Adults	66	25	61	24	73
Recurrent central adenoids	36	22	54	5	15
Progressive deafness	28	7	17	12	36
Tubal tonsil	22	2	5	15	45
Chronic otorrhea	18	8	19	5	15
Lateral pharyngeal bands	15	7	17	4	12
Granular pharyngitis	20	5	12	10	30
Postnasal discharge	12	4	10	5	15
Postadenotonsillectomy	5	2	5	2	6
Recurrent suppurative otitis media	3	2	5	..	..
Patients who discontinued treatments	..	6	..	1	..
Patients whose treatments are incomplete at time of writing	..	..	..	9	..

* Some patients manifested more than one therapeutic indication.

tone of voice, but later fall into the hands of some one unaccustomed to the particular situation, who may advise that the tonsils and adenoids be removed. If the patient follows this advice, he will resort subsequently to the tone of voice associated with cleft palate. Instead, if the adenoid tissue is treated by radium in fractionated doses, the deafness, the frequent colds and their complications which often develop in children with cleft palate can be remedied.

In certain cases in which the tonsils seem definitely pathologic, they alone may be removed, but the adenoids should be left in place to preserve normal speech resonance. The adenoid masses help greatly in

12. Crowe, S. J., and Walzl, E. M.: Irradiation of Hyperplastic Lymphoid Tissue in the Nasopharynx, J. A. M. A. **134**:124 (May 10) 1947.

13. Crowe, S. J.: Irradiation of the Nasopharynx, Ann. Otol., Rhin. & Laryng. **55**:779 (Dec.) 1946.

closing off the nasopharynx after operation for cleft palate because in nearly all such cases the palate, after repair, retracts forward in the line of central scar and pulls it away from the posterior pharyngeal wall, making it almost impossible for the patient to close off the nasopharynx in the normal manner. Complete surgical removal of the adenoids only adds to this difficulty.[14]

Patients with chronic otorrhea who should be chosen for treatment with radium are those whose persistent discharge appears to be due to hypertrophied lymphoid tissue in and about the eustachian orifice. All lesions of the upper respiratory tract, such as deviated nasal septum, sinus disease and hypertrophied tonsils and adenoids, which might contribute to the otorrhea must be corrected. Aural polyps, granulations, caries of the ossicles and signs of mastoiditis must have the more radical surgical treatment [15] of polypectomy and mastoidectomy.

The child with frequent winter colds associated with asthmatic bronchitis derives dramatic relief from radium treatment of lymphoid tissue in the nasopharynx. It is best to give the treatments during the summer season, for infections of the respiratory tract are not then so prevalent and the treatment is less likely to be interrupted. Similarly, a persistent winter cough due to postnasal discharge in a child or an adult may be relieved when the lymphoid tissue of the nasopharynx is irradiated.[16]

EXAMINATION OF THE PATIENT

After the nasal mucosa has been thoroughly shrunken and moderately anesthetized, the nasal passages are inspected with reflected light. The examiner should identify and investigate the various deep structures by palpating gently with a tightly wound applicator and by fixing his gaze on the posterior wall of the nasopharynx at the level of the floor of the nose and requesting the patient to swallow. This act will bring the posterior surface of the soft palate into view if large adenoids or other growths do not retard the elevation of the palate.

When the throat is examined, granular pharyngitis and the lower portion of lateral pharyngeal bands may be observed. The postnasal mirror examination gives a satisfactory view of the nasopharynx if the patient is cooperative and can breathe through his nose when his mouth is open, thus suspending the soft palate far forward.

After mucopus has been aspirated from the floor of the nose, the electric pharyngoscope is passed along the floor of the nose to the naso-

14. Straith, C. L.: Personal communication to the author.

15. Emerson, E. B., Jr., and Dowdy, A. H.: Radium Therapy as an Aid in the Control of Chronic Otorrhea, Am. J. Roentgenol. **49**:234 (Feb.) 1943.

16. Gray, L. N.: The Treatment of Residual Lymphoid Tissue in the Nasopharynx by Radium, J. Allergy **17**:348 (Nov.) 1946.

pharynx. If the patient keeps his mouth closed and breathes through his nose, the soft palate is relaxed and a rapid, thorough inspection of the nasopharynx can be made. By passing the pharyngoscope through a hole in a gauze square or paper towel the examiner affords some protection for himself.[17]

The ears should be carefully examined for increased prominence of the short process and handle of the malleus, with foreshortening of the handle, prominent folds to each side of the short process and a diffuse light reflex. Sharpnell's membrane is often greatly retracted. There may be opacity and dulness of the drum membranes. Hearing tests should include the Weber, Schwabach and Rinne tests with tuning forks, and an audiogram should be made before the beginning of the radium treatments and, again, eight weeks after the last treatment.

TABLE 2.—*Distribution of Patients According to Results of Radium Therapy*

	Duration of Treatment			
	8½ Min.		12 Min.	
	No.	%	No.	%
Recurrent central adenoids disappeared	20	91	5	100
Hearing improved to practical level	4	57	12	100
Hearing improved, but not to practical level	2	28	..	..
Tubal tonsil disappeared	2	100	15	100
Chronic otorrhea relieved	5	62	1	20
Lateral pharyngeal bands disappeared	1	14	1	25
Flat, smooth lateral bands in oropharynx	6	86	3	75
Granular pharyngitis disappeared	3	60	5	50
Granular pharyngitis persisted in oropharynx	2	40	5	50
Postnasal discharge relieved	3	75	4	80
No adenoid tissue observed after adenotonsillectomy	2	100	2	100
No recurrence of suppurative otitis media	2	100	..	..
No change in symptoms, but lymphoid tissue disappeared:				
Otorrhea continued	3	..	4	..
Postnasal discharge continued	1	..	1	..
Hearing unchanged	1	..	..	..
Reactions	1	..	2	..
Surgical adenoidectomy advised	2	..	..	..

Large masses of adenoid tissue may be palpated, with the finger of the examiner sweeping about the nasopharynx through the mouth while simultaneous pressure is exerted through the cheek to prevent the patient from biting down on the examiner's finger. A single lateral roentgenogram of the pharyngeal area will show the size and encroachment on the breathing space of an adenoid mass.[18]

Examination of a child 6 months to 6 years of age is difficult. However, all children who have not had an adenoidectomy have lymphoid tissue in the nasopharynx. When this is removed surgically, the naso-

17. Kline, O. R.: Importance of Pathologic Conditions in the Nasopharynx to the Otolaryngologist, Arch. Otolaryng. **41**:140 (Feb.) 1945.

18. Pancoast, H. K.; Pendergrass, E. P., and Schaeffer, J. P.: The Head and Neck in Roentgen Diagnosis, Springfield, Ill., Charles C Thomas, Publisher, 1940, p. 851.

pharynx can be adequately inspected by passing urethral rubber catheters through the nose to elevate the soft palate. A Yankauer pharyngeal speculum or a Love palate retractor may be used. If the history indicates obstruction to the eustachian tubes, recurrent colds with postnasal discharge or asthmatic bronchitis, the adenoidectomy should be followed by three radium treatments at two week intervals, the course beginning two weeks after the operation. Other children may be immobilized by wrapping them in a sheet in the recumbent position, lightly anesthetizing the nasal passages with tetracaine hydrochloride applied topically and passing the nasopharyngoscope.

I do not feel that the first radium treatment should be given on the operating table at the time of adenoidectomy because of (1) the technical difficulties of administering the treatment with the patient under general anesthesia without unduly exposing the anesthetist to the radium radiation, and (2) the edematous reaction produced by the irradiation therapy, which would aggravate the postoperation reaction.

TECHNIC OF THERAPY

1. The nasal mucous membrane is anesthetized with 2 per cent tetracaine hydrochloride solution.

2. After the radium applicator is removed from the lead cylinder, the applicator is washed in running water.

3. With the patient recumbent, the applicator is passed along the floor of the nasal passageway to the posterior pharyngeal wall. The head of the patient is turned so that the weight of the handle of the applicator causes the opposite end to come into close proximity with the orifice of the eustachian tube. The application of the radium is timed for exactly twelve minutes by means of the alarm clock timer used in the dark room technic of roentgenography.

4. The applicator is then moved to the other side of the nose and the head of the patient rotated to the other side, so that the radium tip of the applicator comes in close proximity with the eustachian orifice. This application is likewise timed for twelve minutes.

5. After each insertion of the applicator, the operator goes to another room. The mother of the child may stay with the patient. Distance is the best protection from the accumulative effect of the radiation. Lead apron and gloves give the operator some protection. Three millimeters of rubber absorb about 75 per cent of the beta rays. The gamma rays penetrate the rubber.

6. Mucus adhering to the applicator is removed with a brush on a long handle or by laying a hand scrubbing brush on the sink and working the applicator through the bristles, holding the applicator by the milled handle on the end distant to the radium capsule. The operator must not hold the brush on the sink with his hand when he is working the applicator through the brush. He must never clean the radium capsule with an alcohol-saturated sponge held by his fingers, even though he is wearing lead rubber gloves.

7. The applicator is quickly returned to its lead cylinder, where it is stored at least twenty feet (6 meters) from where personnel are working.

8. The application is repeated every two weeks for three treatments. At each visit the patient is reexamined for evidences of nasopharyngitis and the

effect of the previous treatment. Two months after the last treatment audiograms are taken to determine the effect of the therapy. Only in exceptional circumstances, and on the advice of a radiologist, is a second course of treatment given within six months after completion of the first course.

9. If acute nasopharyngitis is present, no radiation is given. If mild or chronic nasopharyngitis is present, the radiation is given six minutes to each side and the treatment repeated in seven days. After three weeks, if the nasopharyngitis persists, the same treatment (six minutes' irradiation to each side) is given and repeated in seven days. Three weeks later a final treatment of twelve minutes' irradiation to each side is given.

PERSONAL OBSERVATIONS

During the year Feb. 1, 1947 to Feb. 1, 1948, 74 patients were given radium treatments at the Gill Memorial Eye, Ear and Throat Hospital; they were divided into two treatment groups, as follows:

Forty-one patients were treated by placing the monel metal[9] applicator containing 50 mg. radium sulfate eight and one-half minutes to each side of the nasopharynx. Of these 41 patients, 35 were given three treatments at two week intervals; 6 patients had but one treatment and did not complete their series. A total of 111 treatments were given to patients in this eight and one-half minute group.

Thirty-three patients were treated by placing the same applicator to each side of the nasopharynx for twelve minutes. Of these 33 patients, 23 were given three treatments at two week intervals; 9 patients began their series but still have treatments to undergo, and 1 patient interrupted his series. A total of eighty-eight treatments were given in this twelve minute group.

Since radiation therapy produces results only over relatively long periods, it is difficult to evaluate the results of a one year study. The results recorded in this study are based on (1) the subjective improvement of symptoms, (2) the objective observance of the disappearance of the lymphoid tissue which had been noticed before the radium was administered and (3) the results of audiometric hearing tests in cases of defective hearing.

Nineteen patients were treated for defective hearing associated with lymphoid tissue in the nasopharynx. Seven of these patients had three irradiations of eight and one-half minutes to each side of the nasopharynx, resulting in improvement of hearing to a practical level in 4 patients (57 per cent), improvement, but not to a practical level, in 2 patients (28 per cent) and no change in 1 patient; 12 patients had three irradiations of twelve minutes each to each side of the nasopharynx, and all (100 per cent) had their hearing restored to a practical level.

Thirteen patients had chronic otorrhea with lymphoid tissue in the nasopharynx: 8 patients had the shorter irradiation (eight and one-half minutes), in 5, or 62 per cent, of whom dry ears were observed eight

weeks after the last irradiation; 5 patients had the longer irradiation (twelve minutes to each side), only 1, or 20 per cent, of whom had dry ears eight weeks after irradiation.

Twenty-seven patients were treated for recurrent central adenoids. Of the 22 patients having the shorter irradiation (eight and one-half minutes to each side), 20, or 91 per cent, had no adenoid tissue eight weeks after irradiation, and 2, or 9 per cent, had to have a surgical adenoidectomy because the mass was large on follow-up examination; 5 patients had the longer irradiation (twelve minutes to each side), and all (100 per cent) showed absence of the adenoid tissue on the follow-up examination.

Eleven patients were treated for lateral pharyngeal bands. Two types of results were observed: (1) disappearance of the bands, in a very few patients, and (2) persistence of smooth, flat lateral bands in the oropharynx below the soft palate. The granular and cryptic appearance of the bands was not observed at the follow-up treatment. However, a few patients with residual flat, smooth oropharyngeal bands did suffer from sore throat. Of the 7 patients who were given the shorter therapy (eight and one-half minutes to each side), 6 or eighty-five per cent, had the smooth, flat oropharyngeal bands at the eight week post-irradiation examination, and only 1, or 14 per cent, showed no lateral band. Of the 4 patients who were given the longer therapy (twelve minutes to each side) 3, or 75 per cent, had the residual, smooth oropharyngeal bands, and 1, or 25 per cent, had no lateral band.

Fifteen patients were treated for granular pharyngitis. Of the 5 patients given the shorter radiation treatment (eight and one-half minutes to each side) 3, or 60 per cent, showed no granular pharyngitis, and 2, or 40 per cent, had oropharyngeal granular pharyngitis similar to the condition of the lateral bands. Of the 10 patients given the longer treatment (twelve minutes to each side), 5, or 50 per cent, had no granular pharyngitis, and 5, or 50 per cent, showed the residual granular oropharyngitis.

Seventeen patients had adenoid tissue in or about the orifice of the eustachian tube. All these patients (100 per cent) showed no lymphoid tissue when examined eight weeks after the last treatment.

Nine patients had a postnasal discharge associated with lymphoid tissue in the nasopharynx. Four patients were given the shorter treatment (eight and one-half minutes to each side); of these, 3, or 75 per cent, reported that they had had complete relief; in the other patient the lymphoid tissue disappeared, but the discharge persisted at the follow-up examination. Five patients had the longer irradiation (twelve minutes to each side); of these, 4 (80 per cent) reported complete relief of symptoms, and the other patient did not complete his series of treatments.

Two patients had the shorter irradiation (eight and one-half minutes to each side), and 2 patients had the longer irradiation (twelve minutes to each side) after adenoidectomy and tonsillectomy because excessive adenoid tissue was observed at the time of operation or because the history revealed recurrent colds or recurrent otitis media. At the time of this report, no recurrent adenoid tissue has been observed in any of these patients.

In only 1 patient, or 2 per cent, did a reaction appear to the shorter irradiation (eight and one-half minutes to each side), and 2 patients, or 6 per cent, showed reactions to the longer treatment (twelve minutes to each side). These reactions consisted of nasal stuffiness, aural stuffiness and sore throat.

SUMMARY

The rays emitted by the Army type 50 mg. radium sulfate nasopharyngeal applicator are used to destroy hypertrophic lymphoid tissue in the nasopharynx. The selective action of the beta rays on lymphoid tissue stops cellular mitosis at the time of treatment.

In selected cases, removal of the hypertrophic lymphoid tissue prevents or cures impaired hearing, recurrent nasopharyngitis, aural stuffiness and otorrhea.

A comparison of a short series of patients treated by placing the applicator eight and one-half minutes to each side of the nasopharynx with a similar series of patients treated by placing the applicator twelve minutes to each side of the nasopharynx shows that the longer treatment removes lymphoid tissue safely and more effectively.

130 Seventh Street.

ABSCESS OF THE CEREBELLAR LOBE OF OTOGENIC ORIGIN

Combined Otolaryngologic and Neurosurgical Treatment in Six Cases

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CEREBELLAR abscess is apparently a rare complication of otitis media. Only 6 patients with this lesion have been encountered at the Mayo Clinic during the last ten years. Meltzer [1] reported only 2 encountered during an eleven year period at the Massachusetts Eye and Ear Infirmary. Courville and Nielsen [2] found only 12 cerebellar abscesses in a review of the results of 10,000 necropsies covering a fifteen year period. Despite its infrequent occurrence, this condition occasionally presents itself and knowledge of its various aspects is important.

The routes by which infection may spread from the middle ear and the cells of the mastoid process are conducive to the formation of supratentorial or infratentorial abscesses of the brain. As pointed out by Brunner,[3] Atkinson [4] and others, there are four possible pathways: 1. The lateral sinus may become thrombosed as a result of being in direct contact with infected cells of the mastoid process. Perisinus abscess or localized meningitis may follow, from which in turn infection may extend either directly to the brain along a thrombosed vein by way of a perivascular space or by penetration of the dura in an area of pressure necrosis. 2. The numerous connections of the veins,

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1. Meltzer, P. E.: Treatment of Thrombosis of the Lateral Sinus: A Summary of the Results Obtained During Twelve Years at the Massachusetts Eye and Ear Infirmary, Arch. Otolaryng. **22**:131-142 (Aug.) 1935.

2. Courville, C. B., and Nielsen, J. M.: Intracranial Complications of Otitis Media and Mastoiditis: Statistical Study with Survey of Ten Thousand Necropsies, Acta oto-laryng. **21**:19-60, 1934.

3. Brunner, H.: Intracranial Complications of Ear, Nose and Throat Infections, Chicago, The Year Book Publishers, Inc., 1946

4. Atkinson, M.: Otogenous Cerebellar Abscess, Ann. Otol., Rhin. & Laryng. **47**:1020-1034 (Dec.) 1938.

laterally placed in the posterior fossa, enable the infection to reach adjacent portions of the brain both from the lateral sinus and directly from the cells of the mastoid process or the petrous portion of the temporal bone. 3. A frequent course is that by way of Trautmann's triangle. From the labyrinth the infection may reach the cerebellum by local destruction of bone or by passing along the aqueduct of the cochlea or the endolymphatic duct. 4. Infection has been known to follow the course of the fallopian canal, but this is most unusual.

Chronic suppurative otitis media is generally considered the principal etiologic agent in the formation of cerebellar abscess. Kopetzky [5] stated that in 85 per cent of cases otogenic cerebellar abscess is due to chronic infection of the ear. Asherson [6] in a review of English literature stated that in 33 of 41 cases of abscess of the cerebellar lobe the lesion was secondary to chronic otorrhea and that in 8 it was secondary to acute otorrhea. In 4 of the 6 cases reported in this paper abscess of the cerebellar lobe followed chronic infection of the middle ear. On the other hand, Brunner,[3] Wilkins,[7] Schreiber [8] and others have reported cerebellar abscess arising secondary to acute otitis media in a much higher percentage of cases than we have.

Although numerous controversial aspects exist in regard to the management of cerebellar abscess, these will not be discussed here. It is generally agreed that since the vast majority of cerebellar abscesses are otogenic, the primary focus of infection must be removed. Close cooperation of the otologist and the neurosurgeon is desirable whenever this association is feasible. Factors involved in given cases will determine the nature of the surgical intervention if such intervention is indicated. In Wilkins' series,[7] mastoidectomy was performed before, at the time of, and in some cases after, drainage of the cerebellar abscess. In our series it was performed both during and after drainage of the abscess. The optimal time of operation is when encapsulation has occurred. The route of approach should be through the mastoid portion of the temporal bone when the adjacent portion of the dura is eroded. However, a surgical approach through a clean field is indicated if a definite preformed pathway is not encountered. Successful results

5. Kopetzky, S. J.: Surgery of the Ear, New York, Thos. Nelson & Sons, 1947, pp. 84-89.

6. Asherson, N.: The Otogenic Cerebellar Abscess, with Special Reference to the Posterior Fossa Cerebrospinal Fluid Syndrome, J. Laryng. & Otol. **57**:129-156 (March) 1942.

7. Wilkins, H.: Cerebellar Abscess: Review of Cases, South. M. J. **33**:605-610 (June) 1940.

8. Schreiber, F.: Cerebellar Abscesses of Otitic Origin in Nine Children: Eight Recoveries After Cannulation, Ann. Surg. **114**:330-335 (Sept.) 1941.

have been obtained by either approach, however, as indicated by the reports of Atkinson,[4] Wilkins,[7] Schreiber,[8] Howie,[9] Lewy [10] and others.

Recently, radical treatment of cerebral abscess has received more emphasis than the conservative type previously used, as reported by MacCarty and Griffin [11] and others.[12] It consists of craniotomy, extirpation of ragged, friable walls of the abscess and of necrotic brain tissue, and primary closure without drainage. Adequate amounts of sulfadiazine and penicillin must be administered before and after operation. The last patient in our series successfully underwent radical removal of a cerebral abscess performed by one of us (A. U.).

The prognosis of cerebellar abscess secondary to otitis media under treatment should be more favorable than some of the literature would indicate. Without surgical treatment the condition is 100 per cent fatal. Even with such treatment, some clinics have reported a mortality rate of almost 100 per cent. Brunner reported a mortality rate of 85 per cent in his group of 13 cases. Yaskin [13] had fatalities in 3 of 4 cases. Shuster [14] reported 5 recoveries in 11 cases of abscess of the cerebellar lobe. Asherson reviewed the postoperative results in 70 cases of abscess of a cerebellar lobe over a twenty year period (1920 to 1940). He found that 41 patients (59 per cent) had recovered and 29 (41 per cent) had died. Schreiber reported recovery of children in 8 of his 9 cases. Both of Meltzer's patients recovered. Low mortality rates have also been reported by Wilkins, Atkinson and others. In 4 of 6 cases reported in the present article the patient recovered. The 2 patients who died were critically ill at the time of

9. Howie, T. O.: A Case of Cerebellar Abscess Treated by Drainage and Penicillin Instillation, J. Laryng. & Otol. **59**:226-230 (June) 1944.

10. Lewy, R. B.: Scarlet Fever, Bilateral Mastoiditis with Intervening Pneumonia and Cerebellar Abscess with Recovery, Ann. Otol., Rhin. & Laryng. **51**:264-267 (March) 1942.

11. MacCarty, C. S., and Griffin, J. G.: Some Modern Concepts in the Treatment of Brain Abscess: Report of Three Cases, Proc. Staff Meet., Mayo Clin. **23**:57-63 (Feb.) 1948.

12. Gurdjian, E. S., and Webster, J. E.: Observations on Standardizing the Surgical Management of Intracranial Suppuration, J. Neurosurg. **5**:1-10 (Jan.) 1948. Fincher, E. F.: Craniotomy and Total Dissection as a Method in the Treatment of Abscess of the Brain, Am. J. Surg. **123**:789-805 (May) 1946. Webster, J. E.; Schneider, R. C., and Lofstrom, J. E.: Observations on Early Type of Brain Abscess Following Penetrating Wounds of the Brain, J. Neurosurg. **3**:7-14 (Jan.) 1946. LeBeau, J.: Radical Surgery and Penicillin in Brain Abscess: A Method of Treatment in One Stage with Special Reference to the Cure of Three Thoracogenic Cases, ibid. **3**:359-374 (Sept.) 1946.

13. Yaskin, J. C.: Neurologic Complications of Infections of Temporal Bone and Paranasal Sinuses: Summary of Twenty Years' (1919 to 1938) Experience, Arch. Otolaryng. **30**:157-182 (Aug.); 360-388 (Sept.) 1939.

14. Shuster, B. H.: Cerebellar Abscess, Arch. Otolaryng. **34**:952-957 (Nov.) 1941.

their admission and failed to rally after emergency surgical intervention. It is reasonable to assume that prognosis will be good if early diagnosis and accurate localization are combined with prompt, adequate surgical intervention supported by administration of penicillin and sulfonamide drugs.

The sulfonamide drugs and penicillin provide effective measures for the treatment of acute suppurative otitis media and for the prevention of its complications. Experience has shown that when these therapeutic agents are used judiciously the number of cases in which mastoidectomy is performed for acute involvement diminishes greatly. With the widespread use of these agents, the cerebellar abscess will probably not be seen as a complication of acute otitis media as frequently as heretofore. By the same reasoning, chronic otorrhea will develop in fewer patients who have acute otitis media.

The chronically infected ear requires good conservative treatment or operative care. Between 1929 and 1939 Asherson treated 4,000 patients who had chronic otorrhea. In this series of consecutive cases, there was not a single instance in which intracranial complication was observed. Of the 4,000 patients, 400 required mastoidectomy.

Reports follow concerning 6 patients seen at the Mayo Clinic over a ten year period.

REPORT OF CASES

CASE 1.—A white boy, 15 years of age, was admitted to the clinic and hospitalized on May 19, 1946. Two weeks prior to his admission he had complained of stiffness and soreness of the back of the neck. Twelve days prior to admission he had had two episodes of emesis and generalized headache. Seven days before admission ataxia was evident, with clumsiness of the left hand. According to his history, chronic bilateral otitis media with intermittent periods of drainage had been present since the age of 2 years. For one to two years prior to his admission there had been yellowish purulent drainage almost daily from one or both ears. Otherwise his general condition was essentially normal.

At the time of the patient's admission there was a watery, greenish, slightly odorous fluid being discharged from the left ear. A large perforation was located posteriorly in the left ear drum, from which the discharge came. A moderate degree of conduction deafness was noted. A small amount of fluid was being discharged from an attic perforation in the right ear. Neurologic examination revealed definite ataxia on the left and definite incoordination of movement of the left upper and lower extremities. There was some weakness of the fingers of the left hand on flexion and mobility. Romberg's sign was positive to the left.

The patient had horizontal nystagmus in the right eye, grade 1, and in the left eye, grade 2 to 3 (grading was on the basis of 1 to 4, 1 being the least and 4 the greatest degree). There was also vertical nystagmus. The results of a funduscopic examination were essentially negative; edema was not visible, but there was thickening at the poles. The visual fields were essentially normal. Roentgenograms of the mastoid processes revealed evidence of a destructive lesion on the right and destruction of the mastoid portion of the temporal bone on the left,

which involved the antrum tympanicum and the posterior superior portion of the temporal bone. The roentgenologist felt that there was an extensive area of cellular destruction with apparent involvement of the tegmen mastoides-tympanicum. It was the impression of one of us (O. E. H.) that the lesion could easily be associated with an epidural abscess.

Urinalysis revealed albuminuria, grade 2, and a few erythrocytes and pus cells; the leukocyte count was 11,600 per cubic millimeter of blood.

A neurosurgical consultation was held on May 24. The patient received penicillin and supportive treatment before operation. Sulfadiazine was given preoperatively, 75 grains (5 Gm.) a day, from May 24 to May 27. There was some discussion as to whether operative treatment of the mastoid process should precede an exploration for cerebellar abscess, but, because of the ataxia and the headache, it was decided to explore first.

On May 28 suboccipital craniotomy was carried out on the left side. An abscess 3 cm. in diameter or larger was encountered in the left cerebellar lobe, and about 1 ounce (29.5 cc.) of thick, greenish yellow pus was removed. The wound was irrigated with a saline solution and penicillin, and the abscess was drained by means of a rubber tube. Fifty thousand Oxford units of penicillin was injected.

The patient's convalescence was uneventful. He received a total of 200,000 Oxford units of penicillin intramuscularly daily from May 24 to June 3. On the ninth postoperative day, June 5, radical mastoidectomy was performed on the left for suppurative chronic otitis media with mastoiditis and cholesteatoma. On resection of the mastoid cavity, the dura was exposed on either side of the superior petrosal sinus, and evidence that the infection had directly penetrated through the dura on this level made clear the source of the abscess of the brain. The patient responded well to the operation. Penicillin was administered intramuscularly for five days postoperatively.

On July 17, radical mastoidectomy was carried out on the right side by the anterior auricular approach. The cavity of the middle ear was completely filled with cholesteatoma, and there was beginning caries of the ossicles. Convalescence was uneventful after the second mastoidectomy. The drainage, which was considerable, gradually cleared. The drainage tube was removed from the site of the cerebellar abscess on the left side on the fifteenth postoperative day. The wound healed without further complication or drainge.

A postoperative neurologic examination did not reveal headache, dizziness or ataxia. A slight degree of diplopia persisted, but coordination had improved markedly. The patient was dismissed on October 26. On reexamination, Feb. 8, 1947, he was found to be making satisfactory progress. He returned for reexamination at intervals and was last seen March 1, 1948. At that time residual manifestations of his neurologic deficit were not noted, and both mastoid cavities were clean and dry.

CASE 2.—A white boy, 17 years of age, was admitted to the clinic on April 29, 1938. One month prior to his admission he had influenza complicated with pneumonia. His symptoms included earache, fever, cough, delirium, diarrhea, emesis and urinary incontinence. He recovered rapidly and was feeling well until two weeks before he was admitted to the hospital, when he complained of earache on the left side. The ear drained spontaneously, and the accompanying symptoms were malaise and excessive fatigability. These symptoms persisted until April 28, when he had an attack of projectile vomiting, and severe occipital headaches and dizziness were noted. Within a few hours, he became stuporous and was hospitalized. His condition continued downward.

On his admission the patient's temperature was 98.8 F.; his pulse rate was 72 beats per minute and his respiratory rate 22 per minute.

He responded with difficulty during physical examination and was unable to stand. Nuchal rigidity was not evident. Purulent exudate was present in the left auditory canal, and slight edema of the left optic disk was noted.

A spinal tap was done, and the fluid which was obtained was slightly opaque. It contained 145 lymphocytes and 95 polymorphonuclear cells per cubic millimeter.

The sedimentation rate of erythrocytes was 75 mm. in one hour; leukocytes numbered 11,000 and erythrocytes 4,360,000 per cubic millimeter of blood.

The otologist reported pulsating, creamy yellow pus in the left external auditory canal. The superior and posterior walls of the canal were drooping, and a roentgenogram of the left mastoid process showed cloudiness with evidence of destruction of the cell wall and a possible break in the tegmen mastoides-tympanicum. A diagnosis of suppurative mastoiditis was made. Material obtained from the ear later and cultured was reported as growing Streptococcus haemolyticus and Micrococcus.

A neurologic examination made several hours after the patient's admission revealed nuchal rigidity and bilateral Babinski signs. An absecess of the cerebellum was suspected.

The next day the patient was more responsive and cooperative. Early weakness of muscles of the face was apparent on the right (the right corner of the mouth was lower than the left). Definite grasping weakness was not evident, but incoordination of the upper extremities, which seemed out of proportion to the general weakness of the patient, was present and was more evident on the right than on the left. Nystagmus was marked. The right knee jerk was more active than on the left, and the Babinski signs were positive bilaterally.

Despite the absence of definite localizing signs, exploration of the left temporal and left cerebellar lobe was decided on as the procedure of choice since the patient's condition continued to become worse.

The patient was comatose when brought to the operating room on April 30. He thrashed so that administration of a local anesthetic with the patient in a prone position was unsuccessful and pentothal sodium® was administered by the intravenous route. A burr hole was made in the temporal region on the left, and the lobe was explored. No abscess was encountered and the wound was closed. A straight incision was then made in the suboccipital region and on exploration of the left cerebellar lobe a mushy mass was encountered from which thick, greenish yellow pus escaped. This lesion had no true capsule. The meninges were sutured to the cortex and then sealed off with an electrosurgical unit. The abscess was opened wide and the ends of two pieces of rubber tubing were placed in the depths of the abscess. A strip of gauze was packed loosely around the tubes, and the wound was closed.

Immediately on return to his room, the patient died.

The bacteriologists reported that Str. haemolyticus was present in both the abscess and the brain tissue.

CASE 3.—An unmarried white man, 48 years of age, was admitted to the hospital on March 25, 1940. The relatives gave a history of chronic otitis media of the left ear which had been present for approximately ten years prior to his admission. They related that one year previous to his admission he had suffered pain in the left ear which was accompanied by a discharge and by dizziness. The labyrinth of the left ear was reported "dead" at that time. The left ear, which drained intermittently, had been dry for three months prior to the admission of the

patient. He had had influenza six weeks before admission, and three weeks later he had suffered severe pain behind the left eye and in the back of the head and neck. The pain persisted to a variable degree. At that time complete facial paralysis of the peripheral type occurred on the left side with nuchal rigidity. The facial paralysis gradually diminished.

Physical examination revealed a critically ill patient in a comatose state. His temperature was 99 F.; pulse rate, 108 beats per minute, and respirations, 20 per minute. His blood pressure was 168 mm. of mercury systolic and 98 diastolic. Both tympanic membranes were scarred but discharge of the ears was not present and neither was there any swelling in the region of the mastoid portion of the temporal bone. Nystagmus was present in all directions; the pupils were dilated and fixed. Paralysis of the sixth and seventh cranial nerves was present on the left, and there was mild facial weakness on that side. Kernig's sign was marked, and nuchal rigidity was present; all reflexes were hyperactive.

Results of the caloric test showed a "dead" labyrinth on the left. The leukocyte count was 13,750 and the erythrocyte count 4,450,000 per cubic millimeter of blood.

The pressure of the cerebrospinal fluid was 33 cm. of water; the fluid was cloudy and showed 3,600 polymorphonuclear cells per cubic millimeter. Roentgenograms of the mastoid process showed evidence of complete sclerosis bilaterally. A diagnosis of suppurative labyrinthitis, petrositis and leptomeningitis was made. An emergency operation was performed the same afternoon.

It was found that a large cholesteatoma had destroyed about 2 cm. of the facial canal and had eroded the horizontal (semicircular) canal. This was filled with a brownish substance. A Newman type of labyrinthectomy was performed, and the labyrinth was found to be filled with thick pus and granulation tissue. With the uncovering of the internal acoustic meatus, a mass of thick pus was discovered, and further investigation revealed that the entire posterior surface of the petrous apex had been destroyed. The remaining part of the petrous apex was filled with pus which communicated with a large destroyed area on the dura and the adjacent surface of the left lobe of the cerebellum. A cavity approximately the size of a large hen's egg was found in the left cerebellar lobe.

The patient received a transfusion of 500 cc. of blood while on the operating table. Also, 300 cc. of a solution of sulfanilamide was administered intravenously during the operation; immediately after operation 400 cc. of the sulfanilamide solution was administered subcutaneously.

The patient never regained consciousness after the operation and died at 3 a. m., March 26. Organisms were not cultured from the blood or the cerebrospinal fluid. The pus encountered during the operation was not cultured.

CASE 4.—A married white woman, 49 years of age, was first seen at the clinic on April 30, 1940. She gave a history of intermittent discharge of both ears which had been noted since 1930. In 1938 she noted unusual shifting pains in her head, which were present almost continuously but which were more intense at night. In 1939, radical mastoidectomy was performed elsewhere on the left side. According to the patient, she had pain in the left temporal region for the next seven or eight months. During this period, a purulent fluid drained until some sequestrated bone was removed. In the latter part of 1939 an unusual "crackling noise" occurred in the occipital area; it occasionally recurred and later became constant. Approximately two weeks before her admission, inter-

mittent drawing pains of both temporal areas began to extend posteriorly and to the top of the head. The patient also talked vaguely of other symptoms referable to the head.

Physical examination did not reveal any abnormalities except diffuse bilateral external otitis, which responded well to local therapy. Neurologic examination gave normal results. Later in the year (August 14) a psychiatrist evaluated the patient's condition as a mild compulsion-obsession state. After this had been discussed with her and her husband, she was dismissed. She returned for observation on Oct. 29, 1942 and said that since she was last observed at the clinic there had been an occasional flareup of an inflammatory process which involved the external canal of the left ear and the mastoid area. This had responded well to local applications of heat and oral administration of sulfadiazine. She had also been under observation at a university hospital because of the multiple symptoms referable to the head. There the left carotid artery had been ligated in an attempt to relieve her of the unusual noises in her head.

Physical examination revealed rough and somewhat thickened skin over the left auricle and external auditory canal. The wall of the canal was noted to be pouting and had a defect which led into the mastoidectomy cavity. The ear was dry. Radical mastoidectomy was recommended. The dermatologic diagnosis of the cutaneous condition pertaining to the ear was chronic erysipelas. Oral administration of sulfadiazine was recommended before and after the operation.

The patient was hospitalized on October 30, and 15 grains (1 Gm.) of sulfadiazine was administered every four hours before operation.

The patient was operated on November 2. It was evident that at the previous mastoidectomy the tegmen mastoides-tympanicum and the cerebellum were uncovered. Dense adhesions were present. Over the left cerebellar lobe there was a defect in the bone. The area of the defect was explored with the index finger and found to communicate with the cerebellar lobe. A cholesteatoma was found in the region of the middle ear and the attic. It was thought that an abscess was present, but no pus was encountered. A radical operation was performed. A Penrose drain was inserted into the cerebellum, and a petrolatum gauze pack was placed in the middle ear.

The administration of 15 grains (1 Gm.) of sulfadiazine every four hours was continued for five days after operation. The petrolatum pack was removed on the third postoperative day. The Penrose drain was partially removed on the fifth postoperative day and completely removed on the seventh day. The hospital dismissal note, on November 9, recorded that only a small amount of purulent matter was being discharged from the ear. There was no evidence of erysipelas.

On November 21 the patient stated that she felt "very well." The posterior wound which led into the cerebellum was practically closed and the aural discharge was scant.

On Feb. 23, 1943 the patient returned because of other symptoms, unrelated to those of which she formerly complained. The unusual sensations and noises formerly occurring in her head were not present. The cavity which resulted from the radical operation on the ear appeared in excellent condition.

Case 5.—A white man, 26 years of age, known to be diabetic, was hospitalized on Feb. 13, 1938. At the time of his admission he stated that he had been well until about Feb. 1, 1938, when he had a "cold." Subsequently an earache developed in his left ear. The left ear drained for about one week, but there was no drainage thereafter.

According to his history, the patient had registered at the clinic two years previously because of earache which had developed on the left side following an infection of the upper respiratory tract. At that time the patient was found to have nerve deafness as well as facial paralysis on the left side. A diagnosis of herpes zoster oticus was made. At that time he was also found to have moderately severe diabetes, which could be controlled with insulin.

About one week before he was admitted to the hospital, on February 13, the patient complained of headache, and the family noticed that he seemed drowsy. He was admitted to a hospital in his home town. There the patient continued to be drowsy, became nauseated and vomited on occasions, and became incontinent on several occasions. His parents stated that he had had a chill prior to entering the hospital at home.

On being admitted to the hospital here, the patient was found to be markedly dehydrated. He was stuporous but could be aroused. The oral temperature was 99 F.; the pulse rate, 72; the respiratory rate, 18. He had a well healed postmastoidectomy cavity on the right. Mastoid tenderness was not present on the left, and the external auditory canal was dry. There appeared to be a healed perforation of the ear drum with fulness of the peripheral part of the posterior wall and slight redness. Evidence of facial weakness was not present. However, conduction deafness was marked on the left.

Neurologic examination revealed nuchal rigidity of moderate severity. The Babinski sign was positive on the left, and there was incoordination on the left. There was coarse nystagmus in all directions. Choked optic disks were not revealed by funduscopic examination, although there was a suggestion of early edema of the nerve heads. Most of the neurologic signs seemed to indicate a lesion of the brain stem on the left. The blood sugar determinations and the carbon dioxide-combining power of the blood were normal. The leukocytes numbered 11,600 per cubic millimeter of blood. Other laboratory procedures indicated normal conditions except for slight glycosuria. Increase of the pressure or of the number of cells in the cerebrospinal fluid was not evident.

The patient was observed for twenty-four hours; the stupor became more profound than on his admission and it was more difficult to arouse him. An emergency suboccipital craniotomy was carried out on the left side on February 14, and a large abscess of the cerebellar lobe was encountered and drained. A culture of the pus revealed Str. haemolyticus.

The patient's convalescence was satisfactory. He was dismissed from the hospital on March 16. The wound had healed, and the diabetes was under control. He returned for reexamination in January 1943. There had been no recurrence of symptoms referable to the abscess of the brain.

CASE 6.—A white youth, 17 years of age, was admitted to the clinic on Aug. 25, 1947. He complained chiefly of headache and drowsiness. According to his history, he had frequently had earache, first on one side and then on the other, since the age of 3. He apparently did well until Aug. 2, 1947, when pain developed in the left ear. Apparently the last attack of earache prior to this episode occurred four years previously. There was no history of chills or fever, and the earache gradually subsided.

On August 9 the patient had a sudden severe headache which persisted. Throbbing pains began to develop in the back of the head and in the neck. Since August 13 he had complained of nausea and vomiting. One week prior to being admitted to the hospital here, he began to complain of numbness and paresthesias

of the left arm, hand and leg. There had also been some dimness of vision, and for three weeks prior to his admission he had been receiving penicillin. On examination he was found to be rather drowsy. He complained of headaches and exhibited definite weakness of the left arm and leg. Bradycardia was present; the patient was dehydrated.

Neurologic examination showed weakness of the left upper and lower extremities with definite signs of incoordination, more pronounced in the upper than in the lower extremity. Nystagmus was present in all directions. Funduscopic examination showed choking of the optic disks of 3 diopters, with hemorrhages. The visual fields were grossly normal. All signs and symptoms indicated a cerebral lesion on the left. Roentgenograms of the skull did not show any abnormality.

On August 26, suboccipital craniotomy was carried out on the left side, and the contents of a large abscess of the left cerebellar lobe were evacuated and the capsule of the abscess was enucleated. A catheter was inserted into the cavity from which the wall of the abscess had been removed. Approximately 1 ounce of straw-colored fluid was aspirated from the abscess. It was watery and looked similar to the fluid obtained from a cystic astrocytoma. Culture of the fluid revealed no organisms. Prior to the closing of the wound 100,000 Oxford units of penicillin was injected into the cavity. Postoperatively 20,000 units was injected daily through the catheter. In addition, the patient received 320,000 units intramuscularly on the basis of 20,000 units per cubic centimeter for eight days. The catheter was removed at the end of the eighth day. The patient's convalescence was satisfactory, and the wound healed by primary intention.

Postoperative neurologic reexamination showed little ataxia, but the patient still had nystagmus and some incoordination on the left side. Funduscopic examination revealed that the bilaterally choked optic disks had receded to 2 diopters on the left and 1 diopter on the right. It was felt that the infection of the left mastoid process might well act as a nidus for a recurrent abscess. Examination of the ears revealed normal canals, but the left canal contained pus. There was a large perforation in the posterior inferior portion of the left ear drum from which pus was pouring, and the residual portion of the ear drum was thick and red.

On October 10, radical mastoidectomy was performed on the left for acute hemorrhagic mastitis superimposed on chronic otitis media with cholesteatoma. Postoperatively, the patient received 320,000 Oxford units of penicillin intramuscularly daily for eleven days. The mastoid cavity healed well. Subsequent funduscopic examination revealed further reduction of the degree of papilledema.

The patient returned for reexamination on December 29. The left cavity was in excellent condition and completely epithelized. Two to three weeks prior to his return the patient had had some pain in his right ear, but this had disappeared. He has had no further recurrence of this pain, and apparently, at the time of this report, the abscess of the brain is not reforming.

On Feb. 1, 1948, a letter from the patient asked whether he might play basketball in the approaching winter. He apparently was doing well, and there was no further correspondence with him.

SUMMARY

Otogenic cerebellar abscess is very rare. Sulfonamide drugs and penicillin properly utilized have markedly reduced the complications of acute suppurative otitis media.

In the management of a cerebellar abscess of otitic origin, close cooperation between the otologist and the neurosurgeon is highly desirable. Since the abscess is otogenic, it is important to remove the primary focus either before, in conjunction with, or after, radical surgical treatment of the abscess.

The prognosis will be good when early diagnosis and accurate localization are followed by prompt and adequate surgical treatment and by administration of sulfonamide drugs and penicillin.

The administration of sulfonamide drugs and penicillin combined with radical surgical procedures on the brain and mastoid portion of the temporal bone promises to reduce further the morbidity and mortality which result from cerebellar abscess secondary to otitis media.

TINNITUS AURIUM IN OTOSCLEROSIS

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AND
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TINNITUS aurium when it occurs in otosclerosis has unique features. It is constantly present in the active stage of the disease, and it disappears when the air conduction threshold reaches the 60-90 decibel loss level. In the presence of intact cochlear function, indicated by good bone conduction, the dependence of the head noises on a certain level of air conduction seems to suggest an extraneous origin of the tinnitus. The disease is almost always bilateral, but one side is involved to a greater degree than the other, and frequently the tinnitus is referred to one ear only. On the assumption that a "trigger sound" from the outside initiates the tinnitus, the localization of the sound to one side of the head may be explained by the Stenger phenomenon. The brain shifts the position of the sound toward the ear in which it is heard louder. Chart 1 presents the audiograms of otosclerotic patients with good bone conduction. In the first patient (*A*) there had been tinnitus in one ear or the other in the early stages of the disease, but during the past ten years the head noises disappeared. In the second patient (*B*) the right ear was the seat of the head noises for a very long time. During the year 1943, the tinnitus shifted from the right ear to the left ear suddenly. At that time the patient noticed an aggravation of the deafness in the right ear.

When tinnitus is due to a temporary condition, such as impaction of cerumen or inflammation of the middle ear, the head noises disappear promptly on the removal of the cause. In Ménière's disease, as illustrated in chart 2 *A*, the tinnitus ceased as soon as the patient's deafness became complete. It stands to reason that with the ablation of the function of the ear the head noises must disappear, provided no cortical factor is present.

Relief from head noises is frequently obtained by the use of a hearing aid. By virtue of its masking effect, a hearing aid is useful in cases of tinnitus associated with deafness, according to Saltzman and Ersner.[1] In uncomplicated otosclerosis, the audicle is of greater value, usually, than in any other otologic entity, as regards both deafness and

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1. Saltzman, M., and Ersner, M. S.: Laryngoscope **57**:358, 1947.

tinnitus. We encountered an otosclerotic patient, however, whose head noise were greatly aggravated by the use of a hearing aid. It appeared as though there might be something in the abnormal psychophysiology of otosclerosis that sometimes causes exaggerated sensitivity to extraneous sounds.

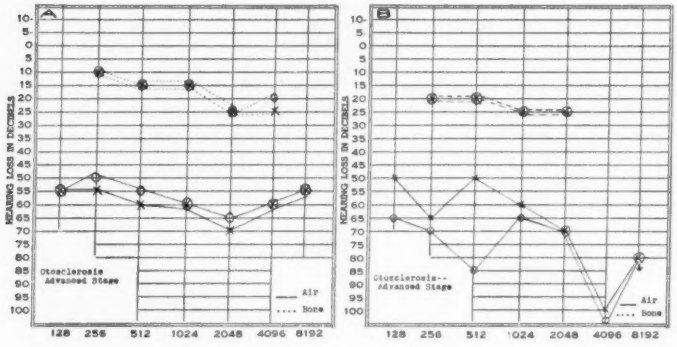

Chart 1.—Audiograms of patients with otosclerosis in an advanced stage. Circles represent the right ear; crosses, the left.

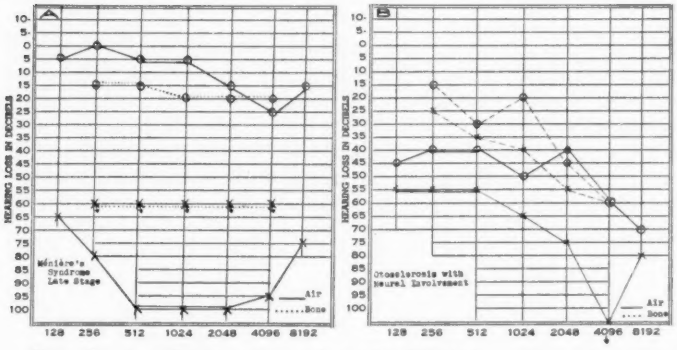

Chart. 2.—*A*, audiogram of a patient with Ménière's syndrome, late stage. *B*, audiogram of patient E. W., aged 50, whose case is reported in this article. Circles represent the right ear; crosses, the left.

REPORT OF A CASE

Mrs. E. W., aged 50 years, consulted us on Aug. 4, 1948. Her complaints were ringing of the ears and progressive deafness dating back twenty-nine years. She noticed an aggravation of her symptoms following pregnancy and childbirth. Otoscopy and nasopharyngoscopy revealed no abnormality. Results of

the Rinne test in both ears were negative, and her audiogram (fig. 2 *B*) was suggestive of otosclerosis with neural involvement. The left ear was selected for the wearing of a hearing aid, as it was the worse ear, with a 55-75 decibel loss for the speech frequencies. As the head noises were most severe in the left ear, it was hoped that the audicle would give the patient relief from tinnitus as well as an improvement in hearing. However, the wearing of the hearing aid in the left ear had a most unfavorable effect, the patient claiming an aggravation of the head noises. Furthermore, the patient stated that the wearing of the hearing aid for a few minutes caused persistence of unbearable tinnitus for several hours. It was suspected that a psychogenic factor played a part in this patient's complaints. Physical examination disclosed no abnormality. Her blood pressure was 120 systolic and 76 diastolic. There were no abnormal spontaneous vestibular manifestations, and the Kobrak caloric test gave normal responses. In order to divert the patient's mind from her left ear, a mold was made for her right ear and she was advised to wear her hearing aid on that ear. At present she is comfortably adjusted with the hearing aid on the right ear and claims to have "forgotten" her left ear.

COMMENT

As a rule, an audiologist advises the wearing of a hearing aid on the ear with a 55-75 decibel loss for the speech frequencies if the threshold of the other ear is at the 40-50 decibel loss level. It is also well recognized that an otosclerotic patient is easily fitted with an audicle. Most often tinnitus is favorably influenced by the use of a hearing aid. In our patient the reverse was the case. While a psychogenic factor might have been present, it is also possible that the "open air circuit hum" of the hearing aid, which is well tolerated by most people with an impairment of hearing, might have acted as a "trigger sound" in the left ear of the patient. From our study we feel justified in stating that in otosclerosis the damping power of the ear is impaired in respect to specific sounds and that some extraneous sounds have a trigger effect in the initiation of tinnitus in this otologic entity. It might well be that the "trigger stimulus" is a vibration at the lowest frequency of the hearing range and that the tinnitus is a harmonic of that tone. During a period of three years we questioned all the otosclerotic persons in our clinic regarding tinnitus. Invariably the head noises disappeared as soon as the air conduction threshold reached a high level even though cochlear function was good as evidenced by bone conduction. This phenomenon can be explained by the hypothesis that otosclerosis is characterized by an abnormality creating persisting harmonics from air-borne low frequency vibrations. When these tones are not heard, owing to a rise of threshold, the harmonics, which are termed tinnitus clinically, are no longer created.

1923 Spruce Street.

1915 Spruce Street.

Case Reports

RHINOPHYMA

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Rhinophyma is an infrequent lesion. Only a few paragraphs describing this condition are to be found in the standard textbooks of otolaryngology.

PREDISPOSING FACTORS

It is almost universally thought that the original condition of the skin is acne rosacea. Synonyms frequently used are "toper's nose," "coppernose," "rum blossom" and "brandy face." Although alcoholism is frequently a predisposing factor, it was stated by Tulipan [1] to be so only indirectly. In his opinion, most, if not all, cases of rosacea are due to a deficiency of the vitamin B complex.

Acne rosacea is a chronic disease of the face characterized by hypertrophy and telangiectasia, often associated with acneform lesions and terminating in rare instances in pronounced hypertrophy of the tissues, particularly of the nose.

Early there occurs erythema, diffuse or in localized patches, which is transient and induced or made intense by exposure to cold or heat. The color of the skin in the affected areas varies from bright to dull red, or may be even purplish.

There is often an associated oily seborrhea, and the orifices of the sebaceous glands may be patulous or plugged with dry sebaceous secretion.

Only exceptionally the disorder progresses to what is termed the third stage. This is characterized by hypertrophy of the tissues, particularly of the nose, which becomes enlarged; the glandular openings become conspicuous; oily seborrhea is marked, and the blood vessels are increased in number and size. The nose presents a dull red or purplish hue, which renders it conspicuous. Coincidentally, the tissue in the immediate vicinity and on the chin may be thickened, and the acneform lesions of the earlier stages may be present over other portions of the face. At times the hypertrophy produces lobulated masses, varying in size from that of a pea to that of a cherry. In rare instances, pendulous masses are produced. These may be limited in number or may be numerous and closely packed. When they are highly developed, an extremely disfiguring condition results, to which the term rhinophyma is applied.

Eggston [2] mentioned rhinophyma under fibromas and described the condition as being in the nature of scar tissue or keloid formation.

Rhinophyma is not so common as the parent disorder, which by no means invariably tends to such extreme alteration. The process may occur on the

1. Tulipan,, L.: Acne Rosacea: A Vitamin B Complex Deficiency, Arch. Dermat. & Syph. **56**:589 (Nov.) 1947.

2. Eggston, A. A., in Nelson Loose-Leaf Living Surgery of the Nose and Throat, New York, Thos. Nelson & Sons, 1946.

forehead or the chin (Sams[3]), but the nose is the site of predilection. Men are involved much more frequently than women. Ginsburg's[4] patient was a woman.

PATHOLOGIC FEATURES OF RHINOPHYMA

The condition usually invades the inferior and anterior parts of the nose; it respects the free border of the alae nasi and decreases in severity from below upward, rarely extending beyond the glabellar region and the lateral border of the nose. It is characterized by irregular elevations, separated by fissures containing accumulated sebaceous masses. The nose has a somewhat violet hue, spotted by dilated veins. The soft tissues only are involved, the nasal bones, cartilage and nasal mucosa remaining intact.

Microscopically, one finds great hypertrophy of the sebaceous glands and considerable leukocytic infiltration, with many plasma cells. The epidermis generally remains uninvolved. The vessels of both the deep and the superficial layer of the corium are involved. Inflammatory changes are seen about the enlarged vessels and sebaceous glands. In some instances the hypertrophy predominates in the fibrous connective tissue. Occasionally the vessels are dilated, sometimes to a degree suggesting angioma.

When allowed to grow, rhinophyma can reach tremendous proportions, causing a great, repelling disfigurement. As in the case here presented, it may produce nasal obstruction and present a mechanical barrier to the placing of food in the mouth.

TREATMENT

The early treatment of rhinophyma lies in the hands of the dermatologist. Discussion here will be limited to the later treatment, after the tumor has progressed to considerable size and the patient anxiously seeks removal. Maliniak,[5] in an excellent article, stated that treatment is far from uniform. He presented a case in which galvanocauterization was used, followed by extensive sloughing and necrosis of both alae nasi and the tip of the nose. He repaired the resulting nasal defect by suturing in a temporal flap.

Eminent authorities on radiotherapy agree that roentgen rays and radium seem to be of no real service in the treatment of rhinophyma.

Sutton and Sutton[6] pointed out that in the milder degrees of connective tissue hyperplasia either multiple scarification or electrolytic puncture often does good, but in advanced cases resort must be had to more drastic measures. Reports by Grattan[7] (1920), Maliniak[5] (1931), Eller[8] (1933) and others would indicate that the logical treatment is decortication. This can be done easily and

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3. Sams, W. M.: Rhinophyma, with Unusual Involvement of Chin, Arch. Dermat. & Syph. **26**:834 (Nov.) 1932.

4. Ginsburg, L.: Rhinophyma in Woman, Arch. Dermat. & Syph. **32**:468 (Sept.) 1935.

5. Maliniak, J. W.: Rhinophyma: Its Treatment and Complications, Arch. Otolaryng. **13**:270 (Feb.) 1931.

6. Sutton, R. L., and Sutton, R. L. Jr.: Diseases of the Skin, ed. 10, St. Louis, C. V. Mosby Company, 1939, p. 1439.

7. Grattan, J. F.: Rhinophyma: Cure by Plastic Operation with a Good Cosmetic Result, J. A. M. A. **74**:1450 (May 22) 1920.

8. Eller, J. J.: Simple Procedure for Cure of Rhinophyma, New York State J. Med. **33**:741-743 (June 15) 1933.

simply by paring off the hypertrophic masses with a razor or scalpel. One must preserve a thin layer of subcutaneous tissue and fibrous membrane overlying the osteocartilaginous frame. The new epidermis provides a satisfactory result. Epithelization occurs from the growth outward of the deep glandular epithelium. If the surface is too glazy, it can be removed and a skin graft applied. Maliniak,[5] however, stated the belief that the use of a Thiersch graft is unnecessary.

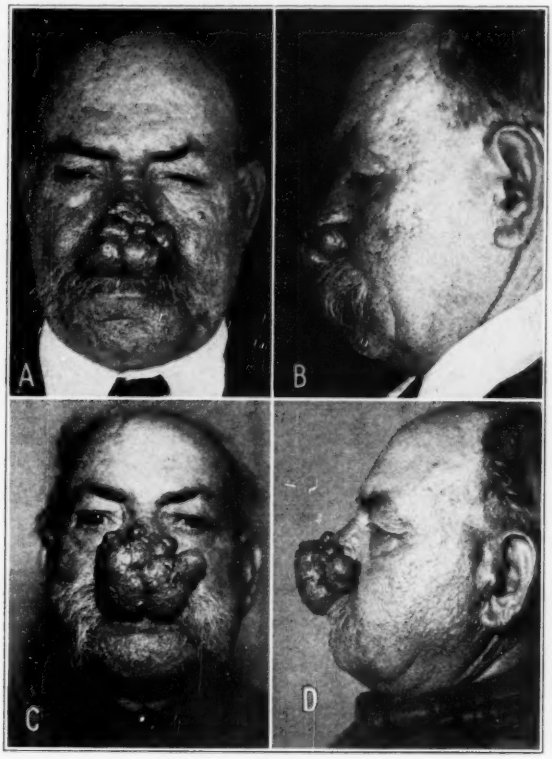

Fig. 1.—*A* and *B*, patient during first visit to clinic, in 1941; *C* and *D*, patient six and one-half years later, showing progression of lesion.

REPORT OF A CASE

Mr. F. R., white, aged 65, an Italian-born fruit dealer and truck gardener, was first seen on May 23, 1948, at the Syracuse Free Dispensary. The chief complaints were a disfiguring growth of the nose, nasal obstruction from the overhanging mass, partial oral obstruction and a bothersome visual obstruction

when he was supine. He came to this country at the age of 13. He stated that during 1927 he had had a swollen, red nose. From a carefully detailed history, one may assume that he had acne rosacea. Twelve months later (1928) he noted a small pimple on the tip of the nose. After three weeks he tried several ointments, with no relief. The lesion continued to grow, and several small, hard, granular masses formed around the original pimple. In 1941 he considered removal of the mass. After having a work-up in the dermatology

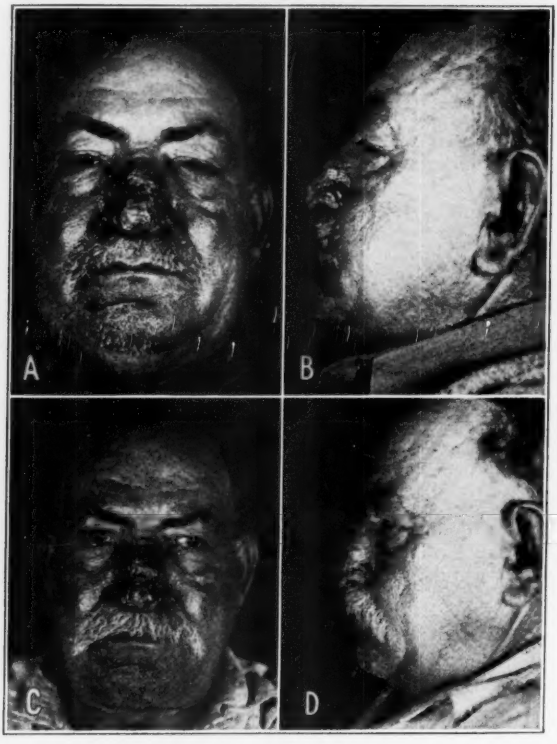

Fig. 2.—*A* and *B*, patient twenty-five days after operation. The area of granulation tissue was treated with trichloroacetic acid; *C* and *D*, patient sixty-three days after operation.

clinic, which included the taking of photographs (fig. 1*A* and *B*), he refused treatment. There was no family history of a similar condition. He had been a moderately heavy wine drinker his entire adult life.

Physical examination revealed a large, multilobular, brownish-blue lesion, involving the entire soft part of the nose from the junction of the nasal bones

and the upper lateral cartilages. The mass was approximately the size of a tennis ball and was pendulous in two discrete portions, which hung down over the nares and most of the mouth (fig. 1 *C* and *D*). Many of the nodular lesions were discrete and separated by definite fissures, which were filled with yellowish white, foul-smelling debris. By lifting the lesion, one could see that the free borders of the alae nasi were not involved. The mucosa appeared normal except in the right vestibule, where a portion of the mass had protruded between the upper lateral and the tip cartilage, leaving the mucosa mounded and blanched. Examination of the ears, mouth and throat revealed nothing remarkable.

Treatment.—After twenty-four hours of penicillin therapy (400,000 units) operation was performed, on May 28. Local anesthesia was used in the same manner as for rhinoplasty. Infiltration with a 1 per cent solution of procaine hydrochloride and application of a 10 per cent solution of cocaine hydrochloride

Fig. 3.—The mass after removal.

to the nasal mucosa proved satisfactory. The lesion was removed with a razor blade. The entire area was decorticated to the thin subcutaneous tissue overlying the osteocartilaginous framework. In the area between the upper and the lower lateral cartilage on the right side, a large section was excised, exposing both cartilages. On removal of the major portion of the lesion, the remaining bed appeared irregular and bumpy. This was shaved down carefully, and a small portion of the subcutaneous tissue of the adjacent (normal) skin was removed to prevent an irregular, raised junction line. Four pieces of absorbable gelatin sponge (gelfoam®) soaked in 5 cc. (200,000 units) of penicillin solution were placed over the operative site. A small rubber tube (Dakin), wrapped in petroleum jelly gauze, was inserted into each naris and the tubes were sutured together, external to the columella. A pressure bandage was then applied over the nose.

The pressure bandage and the Dakin tubes were removed forty-eight hours after operation, leaving just the gelfoam® cap over the nose. There was no

bleeding. After receiving 300,000 units of penicillin daily for five days, the patient was released from the hospital, on June 2. On June 12, the edges of the dark (gelfoam®) pack were loose and beginning to separate. Two days later the cap was easily lifted from the nose in one piece, leaving a dry bed, except for an area of granulation tissue on the right side. The first postoperative photographs were taken on June 22 (fig. 2*A* and *B*). The area of granulation tissue was treated with trichloroacetic acid.

Fig. 4.—Section of the lesion, showing pronounced hypertrophy of sebaceous glands, with formation of a sebaceous cyst (× 55).

The lesion after removal and a photomicrograph of the tissue are shown in figures 3 and 4. The pathologic report conforms to the previously mentioned description of rhinophyma. Photographs taken on July 30 (sixty-three days after operation) are shown in *C* and *D* of figure 2. Arrangements were made for the patient to enter the hospital in October for removal of a small amount of scar tissue over the right tip of the nose, and for the placement of a Thiersch graft.

SUMMARY

Rhinophyma, an infrequent end result of acne rosacea, is occasionally seen and should be treated by the otolaryngologist.

Although several methods of treatment have been stressed, decortication of the hypertrophic masses by means of a razor blade or knife is simple, effective and logical.

The use of penicillin-soaked absorbable gelatin sponge gelfoam® proves most beneficial in the control of postoperative hemorrhage and infection.

The use of intranasal Dakin tubes wrapped in petroleum jelly gauze allows free nasal breathing and permits the use of firm pressure over the dressing without discomfort to the patient.

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ABSCESS OF THE BRAIN FOLLOWING TONSILLECTOMY AND ADENOIDECTOMY

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AND
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INTRACRANIAL complications of infection of the tonsils and adenoids have been fully discussed by Hara and Courville.[1] In their survey of the literature from 1900 to 1940, they recorded the incidence of intracranial complications of tonsillar origin as follows:

Thrombosis of lateral sinus	4
Thrombosis of cavernous sinus	43
Encephalitis, cerebral abscess	13
Embolism	7
Total	67

In only 7 of these cases did the complication follow operation on the tonsils and adenoids; in the majority it resulted from tonsillitis or peritonsillar abscess. The rarity of cerebral complications of operations on the tonsils and adenoids is evident from other statistical data cited by Hara and Courville. In 25,000 autopsy records in the Los Angeles General Hospital only 1 instance of intracranial disease of tonsillar origin was found.

Letherwood,[2] in a series of 10,000 cases of tonsillectomy, cited 1 case, that of purulent meningitis developing in a child. Chisolm and Watkins[3] found 8 cases of thrombosis of the cavernous sinus among 50,000 surgical records, but in no instance was the condition of tonsillar origin. Nesbitt,[4] in his review of postoperative complications in 1,457 cases, mentioned 1 case of meningitis following tonsillectomy and adenoidectomy.

Many similar references in the literature could be cited to make obvious the fact that even though the tonsils and adenoids are frequently the source of infection and the tonsillar and postnasal spaces are often traumatized during tonsillectomy and adenoidectomy, the pathways to the brain are invaded only on the rarest occasion and, fortunately, intracranial complications are extremely rare. Because of this fact, otolaryngologists are inclined not even to think of cerebral abscess as a postoperative complication of tonsillectomy and adenoidectomy, certainly not to the extent that abscess of the lung is so considered.

1. Hara, H. J., and Courville, C. B.: Intracranial Complications of Tonsillar Origin, with Special Reference to Their Incidence and Pathogenesis, Arch. Otolaryng. **35**:530 (April) 1942.

2. Letherwood, T. F.: Complications Following Tonsillectomy, J. Tennessee M. A. **21**:272 (Nov.) 1939.

3. Chisolm, J. J., and Watkins, S. S.: Twelve Cases of Thrombosis of the Cavernous Sinus from a Study of Fifty Thousand Surgical Histories in the Johns Hopkins Hospital, Arch. Surg. **1**:483 (Nov.) 1920.

4. Nesbitt, B. E.: Post-Operative Complications and Results of Tonsil and Adenoid Operations in Children, Brit. M. J. **2**:509 (Sept. 15) 1934.

The report of a case of abscess of the brain developing five days after tonsillectomy and adenoidectomy is warranted in view of the paucity of similar reports in the literature. This case has particular significance in that it occurred during the poliomyelitis season, although at the time there was no epidemic, only an isolated case having been reported in Washington, D. C.

REPORT OF A CASE

The patient, a rather frail boy, had been in good health except for yearly attacks of acute tonsillitis. He had had measles at the age of 4¼ years and had been immunized against diphtheria, smallpox, whooping cough and typhoid.

Prior to operation on May 30, 1947, he was given a careful physical examination, and the only abnormal conditions found were hypertrophied and infected tonsils, cervical lymphadenitis and underweight.

The boy had sustained a slight bump on the head about a month before, which the mother said had caused a "knot." This was not a wound or an infection, and the child required no medical care for this injury, which was not regarded as a significant cause of the cerebral lesion.

The temperature was normal, and the blood count, urinalysis and other routine preoperative examinations revealed nothing abnormal. The operation was without unusual incident, and the child's reaction and convalescence during the subsequent five days showed no significant indication of trouble. The throat healed well, and the postoperative exudate disappeared in the usual time. The temperature was between 99 and 100 F. On the fifth postoperative day he complained of headache and displayed abnormal lassitude and general weakness, followed by persistent vomiting. He became drowsy, and a slight rigidity of the neck was noted. The knee jerks were active, and the suggestion of a Babinski reflex was present, but at first there was no muscular weakness or atrophy. Facial paralysis later developed. The pupils reacted sluggishly to light, and the left pupil was larger than the right. There was some weakness of the muscles of the right shoulder girdle; in fact, the weakness was more pronounced in the upper and lower extremities on the right side. There was no weakness of the intercostal, pharyngeal or abdominal muscles. The spinal fluid was turbid and "poured out of the needle in a stream," indicating increased pressure. The reports of the spinal fluid were as follows:

June 10: The spinal fluid was clear and contained 60 mg. of protein and 40 to 50 mg. of sugar per hundred cubic centimeters and 50 leukocytes per cubic millimeter, with a differential count of 35 per cent polymorphonuclear leukoycytes and 65 per cent lymphocytes.

June 12: The spinal fluid was cloudy and contained 40 mg. of protein and 45 mg. of sugar per hundred cubic centimeters and 400 leukocytes per cubic millimeter, with a differential count of 51 per cent polymorphonuclear leukocytes, 26 per cent lymphocytes and 23 per cent endothelioid cells.

June 13: The spinal fluid had a milky, turbid appearance and contained 200 mg. of protein and 40 mg. of sugar per hundred cubic centimeters and 1,060 leukocytes per cubic millimeter, with a differential count of 65 per cent polymorphonuclear leukocytes, 22 per cent lymphocytes and 13 per cent endothelioid cells.

The smear of the spinal fluid showed no organisms and culture yielded no growth. Several blood cultures were sterile. Other laboratory tests revealed no significant features except for persistent leukocytosis. The temperature ranged from 99.2 to 102.6 F., but prior to his death, on June 14, it rose to 105.8 F.

During the course of the illness the patient was given penicillin and sulfadiazine, without benefit, and, as a diagnosis of poliomyelitis was made, he was placed in a respirator. Death occurred on the fifteenth day following the tonsillectomy and adenoidectomy.

Autopsy Observations.—Autopsy disclosed an abscess of the left frontal lobe of a diffuse type and without a definite capsule. There was no sign of a previous injury to the skull or to the brain. Examination of the mastoid cells, nasal accessory sinuses and other body structures disclosed no source of infection.

COMMENT

This case is of particular significance, as it followed tonsillectomy and adenoidectomy during the infantile paralysis season and a diagnosis of poliomyelitis was made—a reasonable conclusion considering the neurologic findings. The autopsy alone disclosed the true nature of the cause of death. The case suggests the possibility that conditions diagnosed in the past by others as poliomyelitis following tonsillectomy and adenoidectomy may have been intracranial complications of different causation.

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OSTEOMA OF THE TONGUE

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True osteomas occur rather frequently in the bones of the skull and involve the sinus cavities. Osteoma of the tongue is a rare condition. Seven cases have previously been reported. The eighth case is now presented.

REPORT OF CASE

Mrs. M. W., a white housewife, age 30, was admitted to the migraine clinic of Montefiore Hospital, on Dec. 23, 1946. Her chief complaints were headache, postnasal discharge and a tendency to gag and vomit. These had been present for several months. There was no history of pain or difficulty in swallowing. On Jan. 23, 1947, she was referred to the ear, nose and throat clinic for consultation. At that time the patient stated that six days previously she had felt with her finger a mass at the back of her throat.

Examination revealed no abnormalities except of the tongue. At the middle of the right limb of the V formed by the circumvallate papillae, a rounded mass about 1 cm. in diameter was attached to the tongue by a short, broad pedicle. The mass was removed with the area under local anesthesia; slight bleeding was easily controlled with pressure. The laryngopharynx was normal.

Roentgenograms of the skull were taken. The report read as follows: "There are no abnormalities of the bones of the vault. The sella turcica is of normal size and contour. There is no evidence of abnormal intracranial calcification."

The patient was examined one week after removal of the mass. The tongue was completely healed. Palpation failed to reveal any other masses at the base or in the substance of the tongue. Mirror examination of the base of the tongue and the laryngopharynx revealed no abnormalities, but the patient still had the same tendency to gag and vomit as before removal of the growth.

The pathologic report read as follows: "The specimen consists of a hard mass about the size of a pea from the region of the circumvallate papillae. Macroscopic examination revealed that the specimen was an irregular nodule, measuring 8 by 6 by 3 mm. It was bony hard and had to be cut with a saw. It consisted of a central grayish mass, having the appearance of dense bone enclosed by a thin shell of firm grayish white tissue less than 1 mm. thick. Microscopic examination shows the central mass to be compact bone of normal architecture enclosing a few marrow spaces containing loose fibrous tissue, which shows slight focal small round cell infiltration and which is covered with nonkeratinizing stratified squamous epithelium (the figure). The diagnosis is osteoma.

From the Oto-Laryngological service of Dr. A. A. Schwartz, Montefiore Hospital for Chronic Diseases.

REVIEW OF THE LITERATURE

Greig [1] reviewed the literature and cited cases previously reported by Monserrat, Hirsch, Zuckermann and Neumark and Herzog. In addition to these cases, 3 others have been reported, by Jung,[2] Magnien and Perrot [3] and Muta and Ogata.[4] The present case is the eighth to be reported. Information is available on 7 of the cases. Some of the salient features are indicated in the table.

It will be noted that in all 7 fully reported cases the lesions occurred in women. Their average age was 33⅓ years. Symptoms either were absent,

Area of bone and epithelial covering; × 60.

1. Greig, D. M.: Osteoma of the Tongue, Edinburgh M. J. **39**:93-104 (Feb.) 1932.

2. Jung, G.: Osteoma of the Tongue, Beitr. z. klin. Chir. **154**:167-168, 1931.

3. Magnien and Perrot, M.: Osteoma of the Tongue, Ann. d'anat. path. **10**:331-334 (March) 1933.

4. Muta, T., and Ogata, K.: Osteoma of Root of Tongue: Case, Oto-rhino-laryng. (Japanese) **11**:1016-1017 (Nov.) 1938.

the tumor being discovered accidentally, or consisted in slight discomfort, irritation or tendency to gag. All lesions occurred on the posterior third of the tongue. Four of the 7 were pedunculated, 1 was embedded, 1 was sessile and the form of attachment of the other was not stated. In the cases in which the pathologic observations were recorded the tumor was characterized by adult bone formation. Treatment consisted in surgical removal, with or without cauterization of the base of the growth. The operation was simple, and invariably successful (no complications were mentioned).

Fibroma of the tongue is a tumor of moderate vascularity and slow growth, occurring primarily on the anterior two thirds of the tongue. Osteoma occurs only on the posterior third and base of the tongue. Two theories have been advanced to account for the formation of osteomas: The first is that they are a result of bony rests; the second, advanced by Greig,[1] is that an osteoma occurs from degeneration of a fibroma and that those fibromas which arise on the posterior third of the tongue turn into osteomas. According to Greig, the lessened motility

Some Salient Features of Previously Reported Cases of Osteoma of the Tongue

Author	Sex of Patient	Age	Symptoms	Location	Form of Attachment
Monserrat [5]	F	32	None	Postmesial	Pedicle
Hirsch [5]	F	26	Difficulty in swallowing	Dorsum of root	Not stated
Zuckermann [6]	F	30	None	Posterior	Pedicle
Neumark and Herzog [5]	F	58	Difficulty in swallowing	Left vallecula	Pedicle
Jung [3]	F	22	Irritation of throat	Both sides of foramen cecum	Embedded
Magnien and Perrot [3]	F	37	Discomfort in swallowing	Posterior third	Sessile
Witchell	F	30	Tendency to gag	Posterior third	Pedicle
Muta and Ogata [4]	(No Information)				

of this part of the organ is the necessary factor in the change from fibrous tissue to bone. On the pharyngeal portion of the tongue active movements are more restricted; the parts are more fixed anatomically, and a tumor of this portion has little to rely on beyond its own inherent circulation to maintain its metabolism. It degenerates more readily, and with this degeneration comes the deposition of calcium salts. Calcareous salts in this form and quantity act as an irritant, which in time provokes revascularization, during which the calcium is resorbed, changed to its colloidal form and utilized to form heterotopic bone. If there is contraction of the fibrous tissue, the bone becomes consolidated and as dense as ivory.

Monserrat [5] in 1913 reported a case of osteoma occurring in a 32 year old woman. The tumor was about the size of a cherry and as hard as ivory; decalcification was slow and tedious. It produced no symptoms but was accidentally discovered on routine laryngoscopic examination. It arose by means of a pedicle in the mesial plane, about 2 to 3 mm. posterior to the sulcus terminalis linguae. The pathologic report on the specimen read as follows: "Microscopic examination showed normal osseous tissue in which the Haversian canals were few and narrow. The lamellae were arranged in large circular or ovoid systems with few bone

5. Cited by Greig.[1]

cells. This ivory tumor was surrounded by a thin layer of fibrous connective tissue, as with a thick periosteum, and over all lay the normal epithelium of the lingual surface."

Hirsch [5] in 1925 reported a case of osteoma in a woman, aged 26, who complained of difficulty in swallowing. Examination revealed a tumor somewhat larger than a cherry on the dorsum of the root of the tongue. The tumor was removed by snare and was found to be bony hard throughout. Microscopic examination revealed it to be bone covered with lingual epithelium.

A third case of osteoma was reported by Zuckermann [6] in 1929. It was discovered accidentally in the course of a routine examination. The patient's only complaint was of a sensation of a foreign body at the base of the tongue for about a month. Laryngoscopic examination showed the tumor to be dependent from the region of the vallate papillae, a little to the left of the midline, hanging in the vallecula between the root of the tongue and the epiglottis. The mass was removed by snare under local anesthesia. Examination showed the tumor to be about the size of a pea, with a long stalk and a smooth superficial surface; in density it resembled bone. Microscopic examination revealed that the tumor was composed of bone, whose lamellas were packed close together, with very narrow haversian canals and bone spaces.

The fourth case, reported by Neumark and Herzog,[5] was one in which a definite osteoma was associated with cartilage. The lesion occurred in a woman aged 58, who had had difficulty in swallowing for several weeks. The tumor was the size of a walnut, yellow on the surface, with definitely dilated blood vessels, and appeared to be contained in a thin capsule of connective tissue. It arose by a relatively narrow pedicle from the left vallecula and had caused dysphagia by depending toward the esophagus. No explanation was given for the presence of both cartilage and bone in the same capsule.

Jung,[2] in 1931, described a case of osteoma of the tongue of a female student aged 22. She complained of an irritation of the throat. Laryngoscopic examination revealed a hard symmetric swelling on each side of the foramen cecum. Both growths were removed under local anesthesia, and each mass was found to consist of lamellar bone with haversian systems and a marrow cavity. Each tumor was enveloped in fibrous tissue and covered by normal mucosa. Jung stated that he favored the embryonic theory of detachment of a portion of the hyoid bone or mandibular arch as a cause of formation of osteoma.

Magnien and Perrot [3] described a case of osteoma in a woman aged 37, whose only symptom was discomfort on swallowing. A pale pink sessile tumor about the size of a large pea was discovered on the surface of the tongue slightly behind the junction of the posterior third and anterior two thirds. Pathologic examination revealed the characteristic structure of adult compact bone. The authors could give no reason for the formation of the tumor.

SUMMARY

A case of osteoma of the tongue is reported. The rarity of this condition is evidenced by the fact that only 7 other cases are reported in the literature. It is noted that in all reported cases the tumors occurred in women, and all were on the posterior third and root of the tongue.

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6. Zuckermann, M.: Osteoma of the Tongue, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:118-120 (Nov. 14) 1929.

CICATRICIAL STENOSIS OF THE HYPOPHARYNX TREATED WITH SKIN GRAFT

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THE CASE to be described is one of stricture of the hypopharynx following ingestion of lye which did not respond satisfactorily to bougienage. A successful result was brought about by applying the principles of plastic surgery. Through an external approach a skin graft was applied to the cicatrized area after resection of the stricture.

Since 1918, skin grafts have been successfully applied onto freshly denuded surfaces in the presence of salivary secretions, which contain the bacterial flora of the mouth. At that time Waldron, Gillies and Pickerill [1] introduced a stent with the skin graft directly into the mouth. Arbuckle,[2] in 1930, was among the first to report the application of free skin grafts to laryngeal stenoses. Figi,[3] in 1947, reported that he applied this technic to cicatrized laryngeal stenoses with success.

REPORT OF A CASE

A Negro woman aged 20 had ingested lye in a suicidal attempt. She was first seen in the ear, nose and throat clinic of the Gorgas Hospital several weeks afterward, in June 1947, with dyspnea and emaciation. Examination with the laryngeal mirror revealed the hypopharynx to be closed by cicatricial tissue except for an opening so small that no part of the larynx could be visualized. Two to 3 mm. of epiglottis projected above the stricture; the remainder was assumed to be involved in the formation of the scarred bands. On June 26 tracheotomy became necessary, and within a few days gastrostomy was performed for nutritional purposes. From that time until October, several attempts were made to enlarge the opening in the cicatrized hypopharynx. Thiopental sodium U. S. P. (pentothal sodium®) was used for general anesthesia, followed by gradual dilation with laryngeal dilators. The results were not gratifying; the tracheotomy tube could not be closed completely for more than a day or two, owing to the return of the stricture.

In December it was decided to resect the stenosed area through an external approach and apply a skin graft to it. On December 19, with gas, oxygen and ether administered through the tracheotomy tube, an anterior midline incision was made, similar to the one utilized in a standard procedure for laryngofissure. The neck was extended and the incision made from the hyoid bone to the cricoid cartilage and carried down to the laryngeal cartilages. The larynx was entered through the thyrohyoid membrane, and the thyroid cartilage was divided in the

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From the Eye, Ear, Nose and Throat Service of the Gorgas Hospital, Panama Canal Zone.

1. Waldron, Gillies and Pickerill, cited by Padgett.[4]

2. Arbuckle, M. F.: The Cause and Treatment of Cicatricial Stenosis of the Larynx, Ann. Otol., Rhin. & Laryng. **39**:134-143 (March) 1930.

3. Figi, F. A.: The Etiology and Treatment of Cicatricial Stenosis of the Larynx and Trachea, South. M. J. **41**:17-25 (Jan.) 1947.

midline from top to bottom. All the laryngeal structures were intact and appeared to have escaped injury from the offending lye except for the epiglottis. This structure was involved in the formation of the stricture, which was apparent in the immediate supraglottic region (fig. 1). For better exposure, the hyoid bone was divided in the midline and the base of the tongue incised until the whole cicatrized area, as well as a space above the stricture, was clearly exposed. The involved area, in vivo, measured approximately 2 cm. and consisted of bands of varying density. Only the lowermost portion was patent; it admitted the tip of the small finger. The small aperture as noted from above on admission had closed. The involved region was completely excised by blunt and sharp dissection,

Fig. 1.—Sagittal section of the neck showing the cicatrized area and the manner in which the epiglottis was involved.

and oozing, although troublesome, was controlled by epinephrine tampons alone. Survey of the field then revealed a lumen which was entirely adequate. All scar tissue had been removed, including remnants of the epiglottis, and the freshly denuded area measured approximately 3 cm. in length. The lateral piriform fossae were obliterated; however, the little finger could be introduced about 2 cm., and a urethral catheter about 8 cm., into the esophagus. It was evident that much of the esophagus must be closed because of strictures. A piece of air foam sponge rubber,® roughly shaped before sterilization, was trimmed to fit into the prepared area (fig. 2). A tip of the sponge was left projecting from the lower end to fit into the esophagus to help maintain fixation. The sponge, therefore, projected

onto normal mucosa both above and below the freshly denuded hypopharynx. Being 3 cm. in diameter, the sponge was snug enough to provide hemostasis and assert a certain degree of fixation, at the same time maintaining the skin graft firmly against the prepared surface. Padgett [4] stated that in applying skin grafts to cavities allowance must be made for a considerable amount of subsequent contracture and that, therefore, the cavity must be overdistended by the mold. From the left thigh a Thiersch graft 0.25 mm. in thickness, without hair, was cut with a dermatome. It was thought that a better "take" might be obtained with this thinner graft and yet sufficient protection be given the hypopharynx, where

Fig. 2.—Sagittal section of the neck illustrating the position of the sponge stent after the strictures and part of the epiglottis had been excised.

trauma, at most, is mild. The graft was then draped over the previously fitted sponge, with the raw surface outward, and trimmed to the same circumference as the sponge, but with the ends overlapping it. The whole was then inserted into the hypopharynx, so that the projecting tip protruded into the esophagus. The edges of the graft were lifted from the sponge and sutured to the deep margins of the incision on either side with several interrupted atraumatic 0000 plain surgical gut sutures (fig. 3*a*). A piece of German silver wire was passed through the tissues of the neck on one side of the incision, carried through the sponge and graft and

4. Padgett, E. C.: Skin Grafting, Springfield, Ill., Charles C Thomas, Publisher, 1942, p. 70.

brought out onto the opposite side of the incision (fig. 3*b*) to protect against expulsion of the sponge and, possibly, the Thiersch graft. Plain 00 surgical gut was used to close the various subdermal layers, and silk was used to close the skin. The wire was anchored by squeezing a slit lead shot onto either end adjacent to the skin. A small fascial drain was left in place for twenty-four hours.

The patient was given 30,000 units of penicillin every three hours for the one day previous to and the three days after the operation. No special diet was given, nor was oral asepsis attempted after operation. Healing occurred by first intention. The sutures were removed on the fifth and sixth postoperative days and the wire

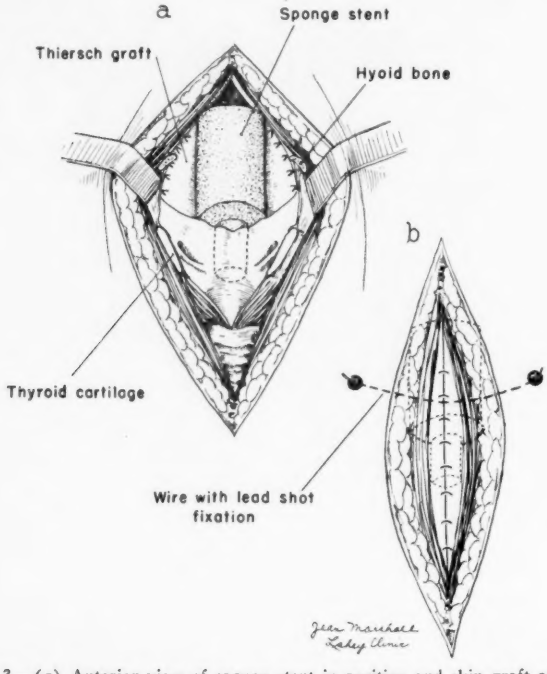

Fig. 3.—(*a*) Anterior view of sponge stent in position and skin graft anchored by fine sutures at deep margins of the incision. The tip of the sponge projects into the postarytenoid region. (*b*) Anterior view illustrating the position of wire anchor held in place by lead shot. The innermost layer has been closed.

was removed on the eighth day. Plans were made to remove the sponge from above, using the laryngoscope; however, the sponge was expulsed shortly after the removal of the wire. The patient assumed a normal speaking voice immediately, and no dyspnea was evident once the tracheotomy tube was closed off. Examination with the mirror revealed that much of the graft was adherent except for small strands at the free margins. The opening was as large as a normal hypopharynx, and the vocal cords were normal and moved well. The tracheotomy tube was removed a week later.

On Jan. 20, 1948, about a month after the graft had been applied, direct laryngoscopy revealed about a 90 per cent "take." The diameter of the lower part of the pharynx had diminished about one fourth as compared with the diameter immediately after operation. The field was clean and the graft adherent. Excess, overlapping strands of skin, noted in the previous examination, were absent, and the skin graft and adjacent mucosa were confluent. This examination was carried out with thiopental sodium after the larynx had been sprayed with 10 per cent solution of cocaine. Immediately afterward an attempt was made to dilate the esophagus, which also had several strictures as a result of the lye burn that had been demonstrated by barium relief while the hypopharynx was still patent. A McGill endotracheal tube was inserted and a no. 5 Jackson esophagoscope was passed to the cricopharyngeal area. As a result of the presence of both the McGill tube and the esophagoscope in the hypopharynx the grafted area was dilated to approximately its original diameter.

At the time of the patient's discharge, on May 28, five months after the operation, the diameter of the hypopharynx was approximately 2 cm. The tracheotomy wound was healed, and the patient had a normal speaking voice, without any signs of dyspnea or stridor.

SUMMARY

A case of stricture of the hypopharynx following ingestion of lye is presented in which a successful result was obtained by resection of the involved area, followed by application of a skin graft. This method provided a much more satisfactory and more rapid procedure than dilation for dealing with hypopharyngeal stricture.

RECURRING MASTOIDITIS, MENINGITIS AND ABSCESS OF RIGHT TEMPOROSPHENOID LOBE

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AND
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IN THIS era of antibiotics, brain abscess is apt to occur less frequently than before, but it does occur and must be coped with. A case of recurring mastoiditis, meningitis and abscess of the right temporosphenoid lobe is reported to remind ourselves of this fact and to point out our approach to adequate drainage of this abscess.

REPORT OF A CASE

E. H., a 12 year old boy, was admitted to the pediatric service of Dr. N. Einhorn, on Jan. 22, 1947, in a stuporous condition of eight hours' duration. Immediate consultation with Dr. A. S. Tornay, of the neurologic service, and one of us (B.H.S.) confirmed the diagnosis of brain abscess of the right temporosphenoid lobe secondary to chronic suppurative mastoiditis. The patient was directly transferred to our service for operation.

On his admission the following history was obtained from the parents: Since an attack of rheumatic fever six years previously complicated by acute suppurative otitis media, the patient had had occasional bouts of discharge from the right ear accompanying attacks of sinusitis; but these bouts had become more frequent. The most recent flareup occurred on Dec. 27, 1946. A severe earache, with purulent discharge, developed on the right side. The symptoms lasted until December 30 and then subsided. On January 10 the symptoms recurred, this time with a high temperature, severe frontal headache and pain in the joints. The headaches were described by the boy as being "like a hammer hitting my head." The pain radiated to the occiput and over the temporal bone of the right side.

The family physician prescribed sulfonamide drugs, codeine, acetylsalicylic acid and acetophenetidin U. S. P., which brought the temperature down, but the headache persisted. In the next few days the boy complained of light headedness and his appetite became poor. The symptoms again gradually diminished until one week later, when, on January 17, the headaches became worse than ever before, general weakness developed and the boy was confined to bed. On January 19 vomiting occurred, nonprojectile in character. This symptom continued on and off, and then, on January 22, the afternoon of admission, the parents noticed that the boy became stuporous and when shaken complained of severe headache. About one hour after the stupor had set in, it was noticed that the patient's arms extended and became rigid, with the hands adducted and the fingers flexed. There were no tremors or generalized convulsions. The parents then rushed the boy to the hospital.

A physical examination at this time disclosed a comatose condition, a temperature of 100.4 F., a pulse rate of 64, Macewen's sign and a blood pressure of 120 systolic and 80 diastolic. There were a slight purulent discharge from the right ear and tenderness over the mastoid; the left ear was normal. The right

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From the Ear, Nose and Throat Service of Dr. Benjamin H. Shuster, Philadelphia General Hospital.

pupil was dilated and reacted slightly; the left pupil was contracted and reacted rapidly. There were palsy on the left side of the face of supranuclear type and weakness of the left arm and leg. The biceps and triceps reflexes were a trifle more active on the left side than on the right. A Babinski sign was elicited bilaterally. There was no definite nuchal rigidity. Approximately 2 D. of choked disk was noted on the right side and less than 1 D. on the left side. A lumbar puncture previously performed showed the spinal fluid pressure to be 360 mm. of water. The fluid was clear. Microscopic examination revealed 90 cells, mostly polymorphonuclear, per cubic millimeter. A complete blood count showed 4,970,000 red cells, the high number probably being due to hemoconcentration, and 24,350 white cells, with 88 per cent polymorphonuclear cells and 12 per cent lymphocytes.

Because of these findings, a preoperative diagnosis of brain abscess of the right temporosphenoid lobe was made and an immediate mastoidectomy, with exposure of the middle and posterior fossae, was decided on. The patient was given 500 cc. of 2.5 per cent dextrose in distilled water before operation to combat dehydration. Then, with the patient under general anesthesia, the usual post-auricular incision was made on the right side and a simple mastoidectomy was performed, careful attention being paid to cleaning out the cells around the lateral sinus plate. The plate was removed, and the sinus itself was exposed and palpated. There was no evidence of thrombus. The posterior fossa was exposed, with no evidence of pus. There was no definite fistulous tract through the tegmen tympani. Because of the localizing signs, it was felt that the abscess was situated fairly high in the substance of the temporosphenoid lobe. It was therefore decided to approach it through the squamous plate.

The mastoid incision was extended over the right auricle and the squamous plate exposed. With a rongeur forceps, part of the bone over von Bergmann's area was carefully bitten away and the dura of the middle fossa brought to view. It was under marked tension, thus accounting for the 2 D. of papilledema. There were no pulsations, a fact which also seemed to point to a deep-seated abscess. A small incision was made in the dura over the temporosphenoid lobe but no pus escaped; therefore a cannula was inserted through the incision into the brain substance. The direction of insertion was almost perpendicular to the squamous plate, slightly upward and forward, for a distance of almost 1½ inches (3.8 cm.) from the dura. At this point it felt as if the cannula had pierced a thin, encapsulating membrane. About 30 cc. of light green pus poured out under pressure. Subsequent culture of the pus proved it to be of Streptococcus haemolyticus origin. With the cannula as a guide, a small rubber tube was inserted into the abscess cavity and then anchored to the skin and subcutaneous tissue. About 5 cc. of penicillin, 25,000 units to the cubic centimeter, was dropped into the abscess cavity through the rubber drain. The wound was packed lightly with iodoform gauze and left open; dry dressings and bandage were applied. The patient was placed under treatment with penicillin given parenterally and sulfonamide drugs administered by mouth, with instructions that the penicillin be dropped into the abscess cavity when it was being redressed.

After operation, the patient again received 500 cc. of 2.5 per cent dextrose in water, by hypodermoclysis. He was given penicillin, 25,000 units every three hours, parenterally and sulfadiazine with sodium bicarbonate, 1 drachm (4 Gm.) every four hours around the clock, by mouth. Dehydration was overcome by parenteral administration of fluids and appropriate electrolytes. Later during the day of operation, the patient's condition was only fair. His temperature and pulse and respiration rates were erratic, with little tendency to stabilize. His right pupil was not quite as dilated as before, but was still sluggish. There was a slight decrease in the papilledema, but the hemiparesis still persisted to the same degree.

The next day he began to show some improvement. His blood pressure, temperature and pulse and respiration rates began to show some evidence of stabilization. His blood count at this time showed slight anemia and a normal leukocyte count; accordingly, he was placed under treatment with liver extract, iron and vitamins.

When the wound was redressed, it was noted that quite a bit of purulent secretion was still coming from the drainage tube. The abscess cavity was irrigated by the gravity method with 100,000 units of penicillin in 10 cc. of saline solution. This was continued daily until the eighth postoperative day, when the patient showed pronounced improvement. He was able to sit up in bed and was alert and responsive. During this time his temperature ranged from 99 to 100 F., but he felt so well that he clamored to get out of bed. He was allowed to sit up in a wheel chair and was able to be taken to the clinic for redressings.

On February 3, the eleventh postoperative day, he accidentally pulled the rubber drain out and had to be taken to the clinic the next day to have the tube replaced. The partially organized drainage channel was located, and another rubber tube was inserted into the abscess cavity, with the aid of a grooved director. Some

Position of drainage tube in abscess cavity.

purulent discharge, about 2 cc., still exuded. Two days later, when the wound was again redressed, the tube was still in place and only a small amount of serous fluid was then draining from it. The patient was alert and felt well. To visualize the position of the drainage tube, a roentgenogram was taken; it showed that the tube apparently was still in the abscess cavity (figure).

On February 8, sixteen days after operation, the patient was seen in the eye clinic, and there was only slight evidence of papilledema and hyperphoria in the right eye. The pupils were practically normal. The patient was feeling very well. During the period in which he was coming to the clinic every other day for redressing of the wound, we gradually pulled out and shortened the rubber drainage tube about ¼ inch (0.6 cm.) at a time.

On February 18, the twenty-sixth postoperative day, determinations of the visual fields revealed left homonymous hemianopsia, which suggested that some damage had been done by the brain abscess to the right optic radiation. This condition was still present when the patient was discharged. Except for this, he was doing well, so much so that, on February 24, the thirty-second postoperative day, the penicillin therapy was discontinued—use of sulfonamide drugs had been discontinued several days before. He continued to feel well and was free from symptoms until the thirty-sixth postoperative day, when he awoke with headache,

nausea and vomiting. His temperature was 100.2 F., the pulse rate 90 and the respiration rate 22. There was slight nuchal rigidity, the pupils were dilated, the right more than the left, with suggested Kernig and Brudzinski signs. There was a slight increase in the papilledema, and the disk margins were blurred, chiefly on the nasal side of the right eye. The patient was crying and moaning and was slightly delirious. A complete blood count taken at this time showed 4,610,000 red cells and 15,800 white cells, with 97 per cent polymorphonuclear cells and 7 per cent lymphocytes.

It was felt that this flare-up of meningeal irritation was probably due to the result of the drainage tube being shortened too soon and the discontinuance of the penicillin injections. This had caused a slight residual infection to light up. The small tube, therefore, was removed and a larger drainage tube inserted into the abscess cavity, about 2½ inches (6.5 cm.) from the edge of the wound. As the tube was being inserted, about 0.5 cc. of purulent material exuded. The patient was then given about 100 cc. of 50 per cent dextrose intravenously. Because of his restlessness and delirium he was given 1 drachm of chloral hydrate and ½ grain (0.032 Gm.) of phenobarbital. He was again placed under penicillin treatment, 50,000 units being given every three hours. A blood culture taken before the penicillin therapy was started showed a heavy growth of Str. haemolyticus. That night the temperature rose to 103 F., and there was an increase in nuchal rigidity with positive Kernig and Brudzinski signs. For two days the temperature ranged between 101 and 104 F. and the pulse rate between 100 and 120; thereafter, the symptoms subsided gradually, and, finally, on March 3, the thirty-eighth postoperative day, the patient showed decided improvement. The temperature was down to 99 F., there was no nausea and he again became alert, responsive and cheerful. Two days later he was given a blood transfusion to bolster his resistance. From this time he improved daily. The discharge from the drainage tube, which first was purulent, gradually became serous; then, finally, there was no discharge at all.

On March 12, forty-eight days after operation, the patient was still feeling well. A complete blood count at this time showed 4,020,000 red cells and 8,100 white cells, with 60 per cent polymorphonuclear cells and 40 per cent lymphocytes. The rubber tube was again gradually pulled out and shortened, until, about the fifty-fifth postoperative day, it was entirely removed. This time no further flare-up occurred. Before discharge, another determination of the visual field showed left homonymous hemianopsia, of about the same degree as before. The blurring and papilledema of the disks were now completely gone. On March 21 the patient was discharged, completely free from symptoms except for the hemianopsia and slight weakness of the left side. When he was seen recently in the outpatient clinic he was completely free from symptoms and was gaining weight and feeling strong.

COMMENT

It was felt that dilatation of the pupil on the homolateral side and Macewen's sign (increased temperature with depressed pulse) were significant findings in helping to make a correct diagnosis.

Immediate exploration was an important factor in obtaining a successful result.

Minimum manipulation of the abscess cavity and the use of antibiotics were also important factors in arriving at a cure.

Even though some surgeons advocate complete excision of the abscess and other surgeons drain the brain abscess, instil penicillin and close the wound tightly, we believe that even with penicillin therapy it may still be a mistake to remove the drainage tube too early.

1824 Pine Street.

Progress in Otolaryngology

Summary of the Bibliographic Material Available in the Field of Otolaryngology

REVIEW OF ALLERGY FOR 1947

E. L. MacQUIDDY, M.D.
AND
E. A. HOLYOKE, M.D.
OMAHA

THE EFFECT of the return to peacetime work by many writers in the field of allergy is clearly shown in 1947 by the marked increase in the volume of literature on this subject and the consequent increased length of this review. The military aspects of allergy, so conspicuous for the last few years, are represented by only occasional papers. The various therapeutic measures recently developed, especially the antihistaminic compounds, have continued to be the most productive source of literature.

NOSE

King [1] reviews the problem of the patient with chronic nasal symptoms and emphasizes the importance of allergy in such a condition. He outlines a program of study of patients, including a careful history, physical examination and making of nasal smears. A history of an indefinite onset indicates the likelihood of allergy, and a general history, including asthma, urticaria, eczema or a family background of allergic conditions is strongly suggestive. The appearance of clouding of sinuses on roentgenograms may not be definite proof of infection. So-called hyperplastic ethmoiditis, King believes, is an early allergic manifestation. The presence of eosinophils in the nasal smear he regards as diagnostic of allergy. He does not consider cutaneous tests particularly reliable but feels that they should be tried, with a few of the common allergens. House dust and feathers should always be eliminated, and many patients are benefited simply by the covering of pillows and hyposensitization to house dust. King believes that allergy is becoming commoner. In his experience bacterial allergy is rare.

Putney [2] classifies sinusitis as allergic, mechanical and bacterial. The incidence of allergic sinusitis, either simple or complicated by infection,

1. King, E. D.: The Classification and Treatment of Patients with Chronic Nasal Symptoms, Ann. Otol., Rhin. & Laryng. **56**:70-73, 1947.

2. Putney, F. J.: Changing Concepts of Sinusitis, Laryngoscope **57**:664-670, 1947.

is high. Polypi originating from the ethmoid cells or around the antrum suggest allergy. A constant discharge is a common complaint. The nose may appear normal between attacks and be acutely inflamed during them. Putney emphasizes the importance of conservative treatment. The allergic diathesis, he feels, should be the chief object of attack through hyposensitization and the use of specific drugs. Penicillin and the sulfonamide drugs are of no value in the absence of infection. Davis [3] also finds penicillin valueless in treatment of allergic conditions in the absence of infection. Putney considers electrocoagulation or the use of sclerosing solutions of value in some cases but advises against surgical treatment if it can be avoided.

Rawlins [4] discusses the pathology of allergic sinusitis and reviews the antigen-antibody mechanism. Locally, he describes intermittent increased capillary permeability and increased glandular activity with excessive mucous secretion. The allergic membrane he regards as the chief cause of chronicity in sinusitis, and he feels that treatment should primarily be aimed at clearing it up. The case history and the examination of nasal secretions for eosinophils are the chief points in diagnosis. In another paper Rawlins [5] discusses more fully a method for obtaining nasal secretions for examination. Treatment, he believes, should be conservative so far as possible. Perennial inhalants should be removed, and the patient should be hyposensitized to those that cannot be avoided. The most important allergens, he feels, are house dust, molds, tobacco smoke and paper. The methods for hyposensitization are discussed, and the importance of regulation of dose to the symptoms is emphasized.

Lawson [6] considers the nonseasonal type of allergic sinusitis of the most interest to the rhinologist. Like King,[1] he does not find skin testing particularly effective and prefers tests with inhalants. Desensitization treatment he has found highly successful. He mentions three nonconservative measures, because "some patients will resist all conservative therapy." These measures are use of (1) the galvanic current, (2) the electrocoagulating current and (3) sclerosing solutions (5 per cent sodium morrhuate or 5 per cent solution of sodium psylliate [sylnasol®]).

3. Davis, D.: Inhalation of Penicillin Aerosol and Penicillin-Streptomycin Aerosol in Office Practice, Arch. Otolaryng **46**:307-317 (Sept.) 1947.

4. Rawlins, A. G.: Chronic Allergic Sinusitis, Laryngoscope **57**:381-399, 1947.

5. Rawlins, A. G.: A Method of Obtaining Secretions from the Nasopharynx for Diagnosis of Nasal Allergy (Particularly Useful in Dry Noses), Laryngoscope **57**:95-96, 1947.

6. Lawson, L. J.: Changing Concepts of Therapy of Chronic Sinusitis, Ann. Otol., Rhin. & Laryng. **56**:416-424, 1947.

Robison [7] again reviews his concept of the pathogenesis of allergic sinusitis and discusses his method of treatment by increasing tissue pressure through the use of a balloon filled with iodized oil introduced into the sinus. This pressure, he feels, helps to accelerate the absorption of stagnant tissue fluid.

In a discussion of nasal polypi, Shea [8] states that most of these growths are allergic in origin. There are, however, a sufficient number of serious nasal growths to justify the microscopic study of all polypi removed. Allergic polypi, he feels, are usually pedunculated and generally occur in the middle meatus. The epithelium may vary from stratified squamous to columnar. The stroma is usually loose and infiltrated with exudate, with a few large and small mononuclear cells. Eosinophils are variable in occurrence and may be abundant during an attack and almost absent between attacks. Patients with hay fever may go for years without polypi, but patients with vasomotor rhinitis due to dust, fungi and food sensitivities are said constantly to possess them. Inflammatory polypi, in contrast to allergic polypi, are said to contain less exudate, to exhibit polymorphonuclear leukocytes and not to be limited to the middle meatus.

Hollender [9] believes that after the surgical removal of polypi, zinc ion transfer is a valuable method in the prevention of recurrence. The allergic theory of causation of polypi he considers controversial.

Westcott [10] outlines measures for treatment of patients with vasomotor rhinitis. He recommends a program of elimination of possible allergens and the use of high doses of vitamin A (50,000 to 100,000 units per day) in cases of bacterial allergy and of ascorbic acid (100 to 500 mg. per day) in cases of allergy due to inhalant sensitivities. The antiallergic drugs are recommended for symptomatic relief.

McBean [11] has found nicotinic acid of value in the treatment of intrinsic vasomotor rhinitis. He also suggests a program of elimination of possible allergens, desensitization to house dust, electrocoagulation of mucous membranes over the turbinate bodies and the elimination of nose drops.

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7. Robison, J. M.: Pressure Treatment of Allergic Sinusitis, Arch. Otolaryng. **45**:405-431 (April) 1947.

8. Shea, J. J.: The Pathology of Nasal Polyps and Related Growths, Ann. Otol., Rhin. & Laryng. **56**:1029-1034, 1947.

9. Hollender, A. R.: The Prevention of the Recurrence of Nasal Polyps: A Comparison of Results of the Postoperative Use of Radium and Zinc Ion Transfer, Ann. Otol., Rhin. & Laryng. **56**:932-936, 1947.

10. Westcott, F. G.: Perennial Vasomotor Rhinitis: A Modern Approach to Diagnosis and Treatment, New York State J. Med. **47**:57-59, 1947.

11. McBean, J. B.: Observations on the Management of Vasomotor Rhinitis, Minnesota Med. **30**:399-402, 1947.

Haas [12] presents a general review of allergy in rhinolaryngologic practice and outlines his method of handling allergic patients.

HAY FEVER

In a discussion of the treatment of hay fever, Rackemann [13] points out that a relatively small series of doses of pollen extracts can produce good clinical results if the quantities are correlated with the tolerance of the individual patient. If individual tolerance can be recognized, the danger of systemic reactions is not great, as dosage can be regulated below that level. Rackemann, however, emphasizes the variability of tolerance levels in different persons, and even in the same person during different seasons, so that great care and close study of good clinical records are necessary. He is of the opinion that the treatment of hay fever may be simplified in the future.

Lazarowitz [14] found that the chilling method of injection (consisting of chilling the site of injection by bandaging on a small ice bag for fifteen minutes before and after injection) is of value in the safe treatment of extremely sensitive patients. No delayed reactions were observed in the treatment of 30 patients. The rationale of this metnod lies in slowing down the rate of absorption from the site of injection by vasoconstriction.

Zonis and Rubin [15] report that they were unable to predict general reactions by testing patients with fractions of ragweed pollen. They feel that the fractions are not pure substances and that the impurities may be responsible for some reactions.

Egeberg and Painter [16] report the results obtained with oral pollen therapy during the years 1937 to 1940. They conclude that it is a satisfactory method for the treatment of seasonal hay fever but that it has certain disadvantages as well as advantages. Against the method are the greater cost of material, the fact that it is a little less effective than parenteral treatment and that it requires careful supervision. In its favor is the absence of severe reactions and the fact that the needle is not required. Of 116 patients treated orally between 1938 and 1940, 60.6 per cent had good results, 22.8 per cent fair results, 6.3 per cent

12. Haas, L. R.: Management of Allergy in Nose and Throat Practice, Eye, Ear, Nose Throat Monthly **26**:313-322, 1947.

13. Rackemann, F. M.: Pollen Tolerance, J. Allergy **18**:164-175, 1947.

14. Lazarowitz, L. C.: Effective Treatment of Extremely Sensitive Hay Fever Patients by the Chilling Method, J. Allergy **18**:104-108, 1947.

15. Zonis, J., and Rubin, N.: The Prediction of Constitutional Reactions by Testing with Ragweed Pollen Fractions, J. Allergy **18**:36-38, 1947.

16. Egeberg, R. O., and Painter, J. M.: Oral Pollen Therapy: A Comparative Study, Ann. Allergy **5**:415-419, 1947.

questionable results and 10.2 per cent no results, whereas of 101 patients treated parenterally, 66.6 per cent had good results, 20.7 per cent fair results, 8.1 per cent questionable results and 4.5 per cent no results. Most patients treated were carried on 60,000 units given twice a week. During the first two years a maximum dose of 90,000 units was arbitrarily chosen, although as much as 240,000 units daily was given later. One patient had onset of asthma two hours after receiving 400 units and was carried on 200 units afterward. Three others acquired reactions to the administration of 15,000 units and their doses were reduced.

Urbach, Jaggard and Crisman [17] obtained experimental evidence indicating the value of oral administration of pollen propeptans in hay fever. Pollen propeptans are derived from prolonged digestion of pollens with acids or acids and alkalis, depending on the pollen group. They are apparently devoid of native protein but retain the type-specific immunologic properties, which can be demonstrated by the passive transfer test. Properly controlled oral, intravenous or bronchial administration of pollen propeptans was found to protect highly sensitized guinea pigs against as high as 20 minimum lethal doses of appropriate allergens.

On the basis of several years' intensive study of 14 patients with hay fever and bronchial asthma, Brown, Holden and Nobili [18] have found an unexpected blocking antibody response to oral pollen therapy. The level did not seem to be related to the patient's clinical progress. Cutaneous tests and ophthalmic tests did not necessarily correspond to improvement or lack of improvement. No long range variations of importance were found during the four year follow-up study.

Hansel [19] reports good results in obtaining relief of hay fever and asthma with nethaphyl® (a combination of nethamine [methylethylamino-phenylpropanol] hydrochloride and butaphyllamine theophylline aminoisobutanol).

Hebald, Cooke and Downing [20] found histamine azoprotein of little value in the treatment of patients with hay fever.

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17. Urbach, E.; Jaggard, G., and Crisman, D. W.: The Chemical and Immunologic Basis of Oral Pollen Propeptan Therapy in Hay Fever, Ann. Allergy **5**:147-155, 1947.

18. Brown, E. A.; Holden, E. M., and Nobili, C.: The Skin-Test Blocking Antibody Response to Oral Pollen Therapy and Criteria for Its Use, Ann. Allergy **5**:402-414, 1947.

19. Hansel, F. K.: Nethaphyl in the Treatment of Nasal Allergy and Bronchial Asthma, Ann. Allergy **5**:397-401, 1947.

20. Hebald, S.; Cooke, R. A., and Downing, L. M.: Clinical and Serologic Study of Ragweed Hay Fever Patients Treated with Histamine Azoprotein (Hepamine), J. Allergy **18**:13-15, 1947.

HEADACHE

Hersh [21] gives an excellent review of the etiology of headache, in which he covers a considerable volume of literature on the subject. In a study of 1,000 cases, he found vasomotor rhinitis to be the commonest etiologic factor. Other factors listed include myositis cervicalis, mechanical obstruction of the nose, sinusitis, neuropsychotic disorders, vascular cephalalgia, ophthalmic, pharyngeal and dental disturbances, involvements of the cervical portion of the spine, otic disturbances, atrophic rhinitis and anemia. Vasomotor rhinitis was the chief factor in 282 cases, an accessory factor in 130 and one of multiple factors in 140 cases. In 231 of the cases of vasomotor rhinitis the condition was considered to be on an allergic basis. Of the cases of vascular cephalalgia, the pain was considered as histamine headache in 5 cases, as migraine in 13 cases, as due to hypertension in 3 cases and as due to an aneurysm in 1 case. Only those vascular headaches preceded by an aura, lasting twelve hours or more and relieved by ergotamine tartrate (gynergen®) were considered as migraine. Histamine desensitization proved to be very successful in the group of histamine headaches. Hersh feels that physical allergy may be an important factor in myositis cervicalis.

Shuey [22] does not believe that many vascular headaches are allergic in origin. Over one half of those not on an organic basis, he feels, are due to psychogenic factors. In only 1 of a group of 16 cases was the headache thought to be allergic.

Hansel [23] and Macy and Horton [24] discuss the use of histamine in the treatment of some forms of headache. Hansel states that in 32 of 126 cases of unilateral headache the condition was due to histamine. These cases could be differentiated from cases of migraine on the basis of short attacks and the absence of visual disturbances, and from cases of trigeminal neuralgia by the absence of a trigger zone. Sweating, tearing, nasal congestion and flushing of the skin on the involved side he found rather characteristic. The headache in these cases was usually controlled with graduated doses of histamine. Five cases are reviewed in detail.

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21. Hersh, J. H.: Some Present Day Concepts of Headache, Ann. Otol., Rhin. & Laryng. **56**:98-119, 1947.

22. Shuey, C. B.: Vascular Mechanisms in Allergic Headaches, South. M. J. **40**:440-443, 1947.

23. Hansel, F. K.: The Treatment of Certain Types of Headache with Histamine, Ann. Otol., Rhin. & Laryng. **56**:152-160, 1947.

24. Macy, D., and Horton, B. T.: The Treatment of Migraine with Histamine: Review of One Hundred and Forty-Four Cases, J. Lab. & Clin. Med. **32**:1546, 1947.

Macy and Horton [24] review a series of 144 cases of migraine. After statistical analysis of their results, they found that the headache of from 23 to 33 per cent of patients was unchanged by histamine therapy. Significant improvement occurred in 33 to 50 per cent of patients with typical migraine and in 40 to 66 per cent of patients with atypical migraine on the intravenous injection of histamine. In 60 per cent of patients with typical migraine there was improvement when histamine was given subcutaneously. Histamine given by both routes was followed by improvement in 70 to 85 per cent of patients with typical migraine and in 74 to 100 per cent of patients with atypical migraine. In 85 per cent there were recurrences, unless the histamine was given up to a critical dose. Macy and Horton conclude that histamine is not specific in the treatment of migraine.

Holden [25] feels that food sensitivity is the factor chiefly responsible for migraine. He discusses the disease and its treatment from the point of view of the ophthalmologist.

Alvarez [26] believes that migraine is primarily a hereditary disease of the brain and that nothing is to be gained by looking for demonstrable pathologic factors in its cause. He is of the opinion that it may be mild, or even latent, in some cases and that it becomes disabling when complicated by hereditary allergy, hypertension, psychopathy or constitutional inadequacy.

The Singhs [27] report on the use of progesterone in the treatment of 23 patients with migraine. These patients all showed evidence of estrogenic overactivity, and in all of them symptoms were prevented or relieved.

MÉNIÈRE'S SYNDROME

Lyman [28] calls attention to what he feels is a chaotic state in the literature on Ménière's disease. He shows the extent to which the term has become loosely used, and hence indefinite in meaning, and suggests that it be dropped in favor of the term "hydrops of the labyrinth," which is descriptive of the true condition.

Cawthorn [29] discusses the pathology and history of Ménière's disease and points out that some authors consider it a disturbance in water

25. Holden, F. A.: Migraine as Seen by the Ophthalmologist, South. M. J. **40**:757-760, 1947.

26. Alvarez, W. C.: The Migrainous Personality and Constitution: The Essential Features of the Disease; A Study of Five Hundred Cases, Am. J. M. Sc. **218**:1-8, 1947.

27. Singh, I.; Singh, I., and Singh, D.: Progesterone in the Treatment of Migraine, Lancet **1**:745-747, 1947.

28. Lyman, H. W.: Ménière's—A Synonym of Confusion, Ann. Otol., Rhin. & Laryng. **56**:352-356, 1947.

29. Cawthorn, T.: Ménière's Disease, Ann. Otol., Rhin. & Laryng. **56**:18-38, 1947.

balance and others an allergic phenomenon. He has encountered few instances in which sepsis was a probable cause and does not believe that the syndrome is due to pressure on the eighth nerve. He reviews 424 cases (234 of males, 190 of females) and finds that the largest group of patients was between the ages of 40 to 50. Treatment is discussed and the importance of reassurance to the patient emphasized. Phenobarbital and scopolamine are said to help some patients, and limitation of fluids and use of a salt-free diet are said to be the best conservative measures. Histamine injections may be of benefit in some cases. Focal infection probably should be searched for, although Cawthorn does not believe that it is a likely cause. Cawthorn also feels that too much attention is given by some authors to insufficiency of the eustachian tube. Surgical treatment is discussed, and references to the literature are cited.

Williams [30] gives an excellent review of Ménière's disease, with extensive citing of the literature on the history, pathology, etiology, diagnosis and treatment, both medical and surgical. He is of the opinion that there is evidence for considering Ménière's disease a form of physical allergy and relating it to myalgia. There is also evidence indicating the antigen-antibody type of allergy. Histamine tests seemed to be of no value in forecasting the results of histamine treatment. Williams' findings do not support Atkinson's [31] belief that there are both vasodilator and vasospastic types, since the response of all types was equally good to administration of both histamine and nicotinic acid. The differential diagnosis of Ménière's disease is discussed.

Atkinson [31] again states his theory of vasospastic and vasodilator types of Ménière's disease. Of 22 cases of the vasodilator type, he obtained relief with histamine in 1. There was improvement in 10 cases and no change in 11.

Harris [32] reports on a series of 112 patients with Ménière's disease treated with intravenous injection of histamine. In 71 patients the tinnitus was completely relieved, in 24 it was described as markedly improved and in 13 as considerably improved. Four patients had no relief. Hearing was improved in 89 per cent of the patients, and vertigo was relieved in 87 per cent.

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30. Williams, H. L.: The Present Status of the Diagnosis and Treatment of Endolymphatic Hydrops (Ménière's Disease), Ann. Otol., Rhin. & Laryng. **56**: 614-646, 1947.

31. Atkinson, M.: Tinnitus Aurium: Some Considerations Concerning Its Origin and Treatment, Arch. Otolaryng. **45**:68-76 (Jan.) 1947.

32. Harris, R.: The Intravenous Administration of Histamine as a Treatment of Ménière's Syndrome, South. M. J. **40**:761-767, 1947.

Of 340 cases reviewed by Kajaer,[33] signs of allergy were present in only 25 per cent, and in none was there evidence of labyrinthine anaphylaxis. Kajaer therefore feels that the allergic processes may affect the vestibular apparatus secondarily through mucosal alteration of the nose and eustachian tube, in contrast to Cawthorn's opinion, previously cited. In many of these cases the condition might thus be considered as psuedo Ménière's disease rather than as true endolymphatic hydrops.

McMahon,[34] on the other hand, believes that the allergic etiology of Ménière's disease should always be considered. He favors the usual allergic management of seeking for the offending allergens, followed by avoidance, desensitization and the use of specific drugs.

Lewy and Fox,[35] treated 47 patients with Ménière's disease with pyridoxine (vitamin B_6). Fifteen of these patients had been under the Furstenberg treatment, and these responded well. Three patients represented complete therapeutic failures, while several others responded very slowly, so that spontaneous recovery may have been possible.

EYE

In a review of the allergic manifestations of the eye, Speas [36] includes the conditions of angioneurotic edema, blepharitis, conjunctivitis and keratitis. After drug therapy, iritis, cylitis, uveitis, endophthalmitis or retinitis may develop. A long list of drugs which may be allergens is given; it includes acetylsalicylic acid, atropine, mercury, barbiturates, camphor, quinine, coal tar products, dinitrophenol, sulfathiazole, local anesthetics and physostigmine. Speas feels that in some cases scintillating scotoma, cataract and sympathetic ophthalmia may also be on an allergic basis. Diagnosis, in his opinion, is to be made on the basis of the history, tests for sensitivity (both cutaneous and conjunctival), elimination and inspection of environment. Vernal conjunctivitis, particularly the limbic type, is said to be the commonest ocular manifestation of allergy. Speas recommends the usual allergic regimen, supplemented by such measures as addition of calcium, histamine therapy, salt-free diet, irrigation of the eyes and use of vasoconstricting drugs in the treatment of this condition.

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33. Kajaer, M.: Ménière's Disease and Allergy, Acta oto-laryng. **35**:390-403, 1947.

34. McMahon, B. J.: Influence of Constitutional Factors in Otological Conditions, Ann. Otol., Rhin. & Laryng. **56**:298-304, 1947.

35. Lewy, A., and Fox, N.: Pyridoxine (B_6) used in the Treatment of Vertigo, Arch. Otolaryng. **46**:681-683 (Nov.) 1947.

36. Speas, W. P.: Some Allergic Manifestations of the Eye, North Carolina M. J. **8**:364-366, 1947.

Woods [37] discusses the allergic aspects of endogenous uveal disease. He is particularly concerned with the ordinary nonpurulent uveitis, iritis or choroiditis, although he recognizes the allergic element in sympathetic ophthalmia and endophthalmitis phacoanaphylactica. Two types of uveitis, nongranulomatous and granulomatous, are differentiated. In the former the bacterial invasion is a minor factor, producing principally local hypersensitivity, which in turn is responsible for allergic manifestations to bacterial products. In the latter the organisms themselves produce lesions, with consequent inflammation, caseation, tissue destruction and often a compensatory overgrowth of granulomatous tissue, features lacking in the nongranulomatous type. The type which develops is dependent on the immunity of the patient and the numbers and virulence of invading organisms. Tuberculosis is used to illustrate the foregoing statements, and Woods feels that, with minor variations, the illustration would hold for other types of organisms as well. A general definition of allergies and their types and a discussion of related immunologic phenomena are given at the beginning of the paper.

Berens, Girard and Cummings [38] present 3 cases of simple glaucoma in which allergic reactions to foods were demonstrated by the pulse-diet method of Coca. In 1 case the disease was brought under control only after institution of an allergen-free diet. In the other 2 cases medical and surgical treatment resulted in control of the glaucomatous hypertension. The progressive loss of visual fields, however, was not checked until allergens were eliminated from the diet, after which there was notable improvement.

A case of glaucoma in a young woman following the oral administration of sulfathiazole is reported by Fritz and Kesert.[39]

Hogan [40] describes a thin, transient membrane which may form on the conjunctiva of the tarsus during the early acute phase of vernal conjunctivitis; its presence suggests an allergic basis in some cases of membranous conjunctivitis.

Six cases of keratitis rosacea due to proved sensitivity to testosterone, with improvement under desensitization treatment, are reported by Zondek, Landau and Bromberg.[41]

37. Woods, A. C.: The Influence of Hypersensitivity on Endogenous Uveal Disease, Am. J. Ophth. **30**:257-274, 1947.

38. Berens, C.; Girard, L. J., and Cummings, E.: Allergy in Glaucoma, Ann. Allergy **5**:526-535, 1947.

39. Fritz, M. H., and Kesert, M.: Glaucoma Following the Ingestion of Sulfathiazole, Am. J. Ophth. **30**:197-198, 1947.

40. Hogan, M. J.: Conjunctivitis with Membrane Formation, Am. J. Ophth. **30**:1495-1513, 1947.

41. Zondek, B.; Landau, J., and Bromberg, Y. M.: Allergy to Endogenous Hormones as a Cause of Keratitis Rosacea, Brit. J. Ophth. **31**:145-155, 1947.

Harbert and McPherson [42] and Goldsmith [43] discuss the possible role of sulfonamide compounds in treatment of periarteritis nodosa. Harbert and McPherson point out that the number of cases has greatly increased since the advent of the widespread use of these drugs; they feel that the compounds may act as haptens, combining with the plasma proteins to form allergens. They report a case of scleral necrosis occurring during the course of periarteritis nodosa. Goldsmith [43] reports a case with autopsy in which the diagnosis is said to have been made on the basis of ophthalmoscopic changes in conjunction with physical findings and the clinical course. The choroidal and retinal arteries were involved.

Sack [44] reports a case of bilateral cataract developing suddenly in a girl of 17 after neurodermatitis, of fifteen years' duration. About 30 similar cases are said to have been reported previously in both American and European literature. Both the neurodermatitis and the cataracts were thought to have an allergic basis, although the mechanism of production of the cataract is not known. The prognosis of the cataract is said to be good under proper surgical management.

Ruiz-Moreno [45] describes a monilid of the eyelid which is thought to be a tuberculin type of reaction to Candida albicans. There is a dry, scaly, severely itching dermatitis bilaterally on both upper and lower eyelids. It often occurs seasonally. Some degree of success has attended treatment with an aqueous extract of C. albicans.

Yasuna,[46] discussing penicillin therapy in uveitis, cites 2 cases in which recovery was hindered rather than aided by it. In his opinion, bacterial products from foci of infection in other areas released on penicillin therapy were responsible for the aggravation of symptoms.

The results of penicillin therapy in 55 cases of infections of the conjunctiva and eyelid are reported by Noe,[47] who found allergic dermatitis in 16 per cent. Results, although striking in a few cases, were not, on the whole, superior to those obtained with other forms of therapy.

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42. Harbert, F., and McPherson, S. D.: Scleral Necrosis in Periarteritis Nodosa, Am. J. Ophth. **30**:727-732, 1947.

43. Goldsmith, J.: Periarteritis Nodosa with Involvement of the Choroidal and Retinal Arteries, Am. J. Ophth. **29**:435-446, 1947.

44. Sack, S. S.: Atopic Cataract: Report of a Case with Tabulated Summary of Previously Reported Cases, Ann. Allergy **5**:353-363, 1947.

45. Ruiz-Moreno, G.: Eczematoid Monilid of the Eyelids ("Candidid"), Ann. Allergy **5**:132-136, 1947.

46. Yasuna, E. R.: Danger of Penicillin Therapy in Active Uveitis, Arch. Ophth. **37**:598-607 (May) 1947.

47. Noe, C. A.: Penicillin Treatment of Eyelid Infections, Am. J. Ophth. **30**:466-479, 1947.

Iliff [48] has had excellent results with beta irradiation in the treatment of vernal conjunctivitis. Of 60 patients so treated, 30 per cent (18) were cured and the condition of 63 per cent (38) was improved. In 7 per cent (4 patients) there was no improvement.

ASTHMA

Lowell and Schiller,[49] studied the vital capacity of asthmatic persons, and found a reduction to as little as 60 per cent after inhalation of aerosolized extracts of pollens of birch, oak, grasses and ragweeds. The subjects with the severest asthma suffered the greatest reduction. In all but 1 subject the vital capacity returned to its previous level in fifteen minutes.

Finke [50] analyzes a series of 100 cases of a condition he considers to be infectious bronchial asthma and states the opinion that it is basically chronic bronchitis. In these cases the asthma is regarded as a symptom, to be considered apart from allergic bronchial asthma, and allergic findings are coincidental. Rational therapy in such cases should be directed toward the infection and should include the administration of sulfonamide compounds and antibiotics. Finke states that such measures may avoid serious pulmonary disease, such as bronchiectasis.

Scherago [51] considers bacterial allergy important in the etiology of asthma. He emphasizes the following factors which may exist in the relation of bacterial infection to atopic allergy: 1. Body resistance to entrance of foreign substances is lowered in an infection. 2. Infection may lower the threshold in sensitive persons and so cause them to show symptoms. 3. Allergic symptoms may disappear in severe febrile reactions. 4. Original simple allergy may be complicated by infection.

Plotz [52] discusses cardiac asthma and concludes that bronchospasm is an important element in certain types of heart disease and that there are cases in which cardiac asthma is indistinguishable from allergic bronchial asthma. In such cases with no basal rales, the use of epinephrine leads to a sharp increase of vital capacity. In cases with basal rales the drug does not have this effect.

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48. Iliff, C. E.: Beta Irradiation in Ophthalmology, Arch. Ophth. **38**:415-441 (Oct.) 1947.

49. Lowell, F. C., and Schiller, I. W.: Reduction in the Vital Capacity of Asthmatic Subjects Following Exposure to Aerosolized Pollen Dusts, Science **105**:317, 1947.

50. Finke, W.: The Significance of Chronic Bronchitis in Infectious Bronchial Asthma, Ann. Allergy **5**:364-375, 1947.

51. Scherago, M.: Bacteral Allergy, Ann. Allergy **5**:1-18, 1947.

52. Plotz, M.: Bronchial Spasm in Cardiac Asthma, Ann. Int. Med. **26**: 521-525, 1947.

Seven cases of death of asthmatic persons, thought to be due to cardiac complications, are presented by Lowance and co-workers.[53] Acute dilatation of the right side of the heart and severe emphysema were observed in 1 of these cases at autopsy.

Rowe and Rowe[54] studied a group of 173 private patients with bronchial asthma who were over 55 years of age. They believe that food and inhalant allergies are the most frequent causes of bronchial asthma in this age group and that they occur with about equal frequency. Rowe and Rowe believe that there is minimal evidence of bacterial allergy as a factor in infectious asthma and did not consider it a major cause in any case in this series.

The absolute contraindication of morphine in the treatment of bronchial asthma is emphasized by Peterson,[55] who presents a physiologically rational outline of treatment for status asthmaticus. Treatment includes full use of helium-oxygen mixtures with heavy ether in oil given rectally or with ether inhalation anesthesia as required by the state of excitement of the patient. Bronchoscopy with the removal of mucous plugs is recommended. A fatal case of asthma, complicated by mediastinal and subcutaneous emphysema, is described, and similar cases are cited from the literature.

Ratner,[56] writing on pediatric allergy, points out that asthma rarely begins before the ages of 3 to 8 years. Frequent bouts of rhinitis usually precede the asthma. Food sensitivity is not considered as important as inhalant sensitivity.

Chobot,[57] however, states that food sensitivity and bacterial infections are the chief causes of asthma during the first few years of life. He feels that food sensitivity tends to disappear later and that there is a free period until the inhalant sensitivities begin to take on a major role. The importance of bacterial infection is emphasized, and the removal of tonsils and adenoids and the use of autogenous vaccines are urged. In another paper, Chobot[58] discusses the differential diagnoses of asthma.

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53. Lowance, M. I.; Jones, E. C.; Mathews, W. B., and Dunstun, E. M.: Cardiac Complications and Deaths in Asthmatic Patients, South M. J. **40**:508-514, 1947.

54. Rowe, A. H., and Rowe, A., Jr.: Bronchial Asthma in Patients over the Age of Fifty-Five Years: Diagnosis and Treatment, Ann. Allergy **5**:509-518, 1947

55. Peterson, H.: A Fatal Case of Bronchial Asthma Complicated by Mediastinal and Subcutaneous Emphysema, J. Allergy **18**:413-416, 1947.

56. Ratner, B.: Pediatric Approach to Management of Asthma in Childhood, New York State J. Med. **47**:861-865, 1947.

57. Chobot, R.: Pediatric Allergy, West Virginia M. J. **43**:159-162, 1947.

58. Chobot, R.: Differential Diagnosis and Symptomatic Treatment in Asthmatic Patients, Am. Pract. **1**:436-438, 1947.

The problem of asthma in military personnel is discussed by Smith [59] and Fishman.[60] Smith states that bronchial asthma cannot be successfully treated in a military environment, as there are too many factors beyond the control of the physician. A hundred cases are presented in which the men were disabled an average of 114.5 days each. Of these, 78 per cent had a preenlistment history of asthma.

Fishman [60] also reviews the cases of 100 patients with asthma evacuated from overseas. Of these, 56 had no previous history of asthma, and 78 were asymptomatic and needed no further treatment on return to the United States.

Waldbott [61] questions whether or not sufficient emphasis is placed on the rehabilitation of the asthmatic patient after an attack. The customary methods of treatment are, of course, necessary during the attack, but Waldbott feels that harm can be done by unduly extending such measures. He outlines a program to overcome the invalidism of the asthmatic patient which includes carefully graded light exercises, gradual exposure to such antigens as animal emanations and house dust, and the institution of a high caloric diet if the patient is emaciated. Duke's method of gradually building up tolerance against sudden changes in temperature is suggested, and the elimination of habitual medication, especially by use of hypodermics and atomizers, is advised.

In cases of advanced allergic emphysema, Kahn [62] points out that treatment must be directed against the emphysema, as well as the asthma. Many of the patients are extremely sensitive, and care is necessary in injection treatment. The results of cutaneous tests are frequently negative, but good results may still be obtained from hyposensitization. Kahn feels that allergic rhinitis, sinusitis and polyposis are frequently associated and that, while polypi should be removed, a meticulous allergic regimen is the most important measure. Rest is considered an important part of therapy. Complete recovery when emphysema is well established cannot be expected.

Grove [63] urges surgical treatment for sinusitis in asthmatic patients and reports 200 cases in which operation was performed. He advises the use of antiallergic measures after operation.

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59. Smith, D. S.: Chronic Asthma: Results of Treatment in One Hundred Cases, U. S. Nav. M. Bull. **47**:302-306, 1947.

60. Fishman, A. P.: Etiologic Evaluation of Asthma in One Hundred Cases Returned from Overseas, J. Allergy **18**:115-124, 1947.

61. Waldbott, G. L.: Does the Routine Treatment of Asthma Need Revision? Ann. Allergy **5**:126-131, 1947.

62. Kahn, I. S.: Advanced Allergic Emphysema, South. M. J. **40**:62-66, 1947.

63. Grove, R. C.: Sinusitis and Allergic Diseases, Ann. Pract. **1**:468-474, 1947.

The use of radium in the treatment of asthmatic children is discussed by Ward, Livingston and Moffat,[64] who report 34 cases. The application of 2 gram minutes to each side of the nasopharynx monthly for an average of four treatments resulted in complete disappearance of lymphatic tissue in 23 of the 34 cases, in 15 of which the asthma was completely relieved. In 5 others mild attacks continued, and in 3 the asthma was reported as improved.

Crowe and Walzl[65] found that asthma was improved during radiation treatment for deafness.

Barach and Garthwaite[66] report on the effectiveness of physiologic and antibiotic therapy in cases of intractable bronchial asthma. In patients becoming refractory to epinephrine and aminophylline, they found that substitution of meperidine hydrochloride (demerol hydrochloride®), in 50 cc. doses to avoid side effects, and inhalation of 50 per cent oxygen will often terminate persistent bronchial spasm. Intravenous injection of isotonic or hypertonic dextrose solution is often helpful. Physiologic therapy also includes helium-oxygen inhalation, positive pressure respiration, ether anesthesia, bronchoscopy and induction of artificial fever. Antibiotic therapy is said to have limited, but unquestionable, value in selected cases.

Miller,[67] also writing on the physiologic basis of treatment of intractable asthma, points out that such therapy depends on the realization that bronchial asthma always means obstruction, whether due to bronchial spasm, mucus plugging or bronchial edema, that the asthma is a defense mechanism and that the usual causes are infection and allergy.

Goodall and Unger[68] treated 10 patients in status asthmaticus by the continuous intravenous administration of aminophylline and recommend this treatment in the severest types of cases. Two to 3 Gm. of aminophylline dissolved in 2,000 cc. of 5 per cent dextrose in distilled water or isotonic sodium chloride solution was given at the rate of 28 drops per minute. Goodall and Unger feel that large doses should be used initially and should be gradually reduced as the asthmatic symp-

64. Ward, A. T., Jr., Livingston, S., and Moffat, D. A.: Asthma in Children: Treatment with the Radium Nasopharyngeal Applicator, J. A. M. A. **133**:1060-1062 (April 12) 1947.

65. Crowe, S. J., and Walzl, E. M.: Irradiation of Hyperplastic Lymphoid Tissue in Nasopharynx, J. A. M. A. **134**:124-127 (May 10) 1947.

66. Barach, A. L., and Garthwaite, B.: Physiologic and Antibiotic Therapy of Intractible Bronchial Asthma, Ann. Allergy **5**:297-316, 1947.

67. Miller, H.: Physiological Basis of the Treatment of Intractable Asthma, California Med. **66**:128-130, 1947.

68. Goodall, R. J., and Unger, L.: Continuous Intravenous Aminophyllin Therapy in Status Asthmaticus, Ann. Allergy **5**:196-202, 1947.

toms subside. Complete or partial relief was obtained in 9 of the 10 cases, but the authors state that relapse may occur when the treatment is discontinued.

Prigal, Brooks and Harris [69] administered aminophylline to asthmatic patients in the form of an aerosol from a new combination steam generator and aerosolizer, which they state is inexpensive and practical. The dose of aminophylline required when given in this way is extremely low (it is estimated that not more than 0.05 Gm. is inhaled) as compared with what is required for the effective intravenous treatment. Side effects are thereby avoided. The apparatus can also be used for penicillin therapy when indicated. Of 40 patients with asthma treated with aerosol of aminophylline, 32 obtained some relief. Five patients with severe asthma who failed to respond to intravenous administration of aminophylline were relieved. It is stated, however, that some patients will respond to intravenous use of aminophylline who do not respond to the aerosol, and in some the condition is refractory to both treatments. The vital capacity was increased to an average of 20.6 per cent in 9 cases in which studies were made.

Wyrens [70] also reports on the use of aminophylline in the treatment of asthma. He considers an average dose 7½ grains (450 mg.) of aminophylline in 10 cc. of solution given parenterally and recommends suppositories containing 7½ grains for home administration. He emphasizes the value of aminophylline in cases in which epinephrine is contraindicated.

Segal and Beakey [71] report on the use of a new bronchodilator drug, isuprel® hydrochloride (1-[3,4′-dihydroxyphenol]-2-isopropylaminoethanol hydrochloride) in the treatment of bronchial asthma. They have used the drug in subcutaneous doses of 0.2 to 0.33 cc. of 1:1,000 solution and in oral doses of 30 to 60 mg. daily, as well as in the form of an aerosol with oxygen in doses of 1 cc. of a 1:100 dilution every three hours. They have found alarming reactions from subcutaneous doses of more than 0.5 cc. of a 1:1,000 solution and state that isuprel® should not be given intravenously. Small doses can be given until individual tolerance is determined. Pressor effects and tachycardia are said to be minimal. The results in 82 ambulatory patients treated by oxygen aerosolization of isuprel® and 40 hospital patients treated by one or more methods are presented. Eighty-five per cent of severely ill hos-

69. Prigal, S. J.; Brooks, A. M., and Harris, R.: The Treatment of Asthma by Inhalation of Aerosol of Aminophyllin, J. Allergy **18**:16-28, 1947.

70. Wyrens, R. J.: Aminophyllin in the Treatment of Asthma, Nebraska M. J. **32**:273-274, 1947.

71. Segal, M. S., and Beakey, J. F.: Management of Bronchial Asthma: The Use of 1-3′, 4′-Dihydroxyphenyl-2-Isopropylaminoethanol, Ann. Allergy **5**:317-336, 1947.

pital patients were kept comfortable with this drug alone. The vital capacity was improved as subjective relief was obtained, and the fluctuations in blood pressure on inspiration and expiration were abolished or greatly reduced. Eleven epinephrine-fast patients responded favorably, and no fastness to isuprel® was observed.

Barach and Garthwaite [66] discuss the use of penicillin for patients with severe bronchial asthma. Of 60 patients who received 91 courses of penicillin treatment, clinical improvement is said to have been pronounced in 16 and moderate in 19. In 36 patients improvement was slight, and in 20 there was none. Of 35 patients who were greatly or moderately benefited, 21 continued to show improvement longer and 14 less than two months. Improvement is more sustained in cases in which hyposensitization therapy with catarrhal vaccine and dust is instituted after penicillin treatment and continued indefinitely. Barach and Garthwaite state that penicillin has limited, but unquestionable, value in selected cases of asthma.

The results in 29 cases of asthma treated by intravenous administration of penicillin are reported by Miller,[72] who concludes that the drug is valuable in combating infectious processes, and is thus effective in a significant group of cases of bacterial asthma. It is not, however, a panacea in the treatment of intrinsic asthma. He is of the opinion that the results are not conclusive at present, but warrant further study of the use of penicillin in treating bacterial asthma.

Prigal, Morganbesser and McIntyre [73] discuss the use of steam-generated aerosols of penicillin in the treatment of infections associated with allergies, such as infectious asthma, bronchiectasis, bronchitis and sinusitis. They attach considerable importance to their method as a prophylactic measure and point out that the relief obtained may be temporary. In cases of status asthmaticus it is recommended that preliminary treatment with aerosols of aminophylline and ammonium chloride be administered (Prigal and associates [69]). Various methods for conserving and administering the aerosol are described.

Segal and Ryder [74] report on 85 patients with pneumonia, infective bronchitis, infective bronchial asthma, pulmonary abscess, bronchiectasis, infective laryngotracheobronchial edema, pulmonary emphysema and pulmonary blebs who were treated with penicillin aerosol. There was

72. Miller, M. W.: Penicillin in Intractable Asthma, J. Allergy **18**:109-114, 1947.

73. Prigal, S. J.; Morganbesser, L. J., and McIntyre, F. P.: Penicillin Aerosol in the Prevention and Treatment of Respiratory Infections in Allergic Patients, J. Allergy **18**:325-336, 1947.

74. Segal, M. S., and Ryder, C. M.: Penicillin Inhalation Therapy, New England J. Med. **236**:132-138, 1947.

considerable improvement in many of these cases. The authors caution against indiscriminate use of the method.

The use of penicillin in oil and wax in the treatment of 39 patients with intrinsic asthma is discussed by Gay and Marriott.[75] They injected 600,000 units of penicillin, followed by similar booster doses every five to seven days, and obtained improvement in 31 patients. Gay and Marriott conclude that the method should be tried in any case of infective asthma and that a majority of patients will be benefited by it.

Some of the dangers attending methods of treatment in asthma are pointed out by Mertins [76] and Polonio.[77] Mertins reports several cases of extreme self medication with naphazoline hydrochloride (privine hydrochloride®) with addiction and collapse on withdrawal, while Polonio presents a series of cases of addiction to meperidine (demerol®).

Rackemann,[78] in a discussion of the causes of asthma, emphasizes the general principle that the treatment of an asthmatic patient as a whole man is more important than the treatment of his asthma.

ETIOLOGY OF ALLERGIES

In a statistical study of intense palmar sweating, as determined by the Silverman technic, Cohen and Wolf [79] report that there is a significant increase in atopic persons. This increase, they maintain, is a manifestation of the allergic state and is not due to sampling errors, as race, sex and age are without influence on the results. They conclude that respiratory allergies are probably dependent on an inherent behavior pattern of the autonomic nervous system, as well as on hypersensitivity on an immunologic basis.

Swanton [80] is also of the opinion that asthma may represent an inherited stigma of the autonomic nervous system.

Jimenez Diaz, Lahoz and Canto [81] enumerate the factors in mill dust which they feel might cause occupational asthma in such groups as farmers and millers. They include rust and smut, as well as Coleoptra

75. Gay, L. N., and Marriott, H. J. L.: The Treatment of Infective Asthma with Penicillin in Beeswax and Oil, Tr. & Stud., Coll. Physicians, Philadelphia **15**:91-103, 1947.

76. Mertins, P. S., Jr.: Excessive Self Medication with Naphazoline Hydrochloride ("Privine Hydrochloride"), J. A. M. A. **134**:1175 (Aug. 2) 1947.

77. Polonio, P.: Pethidine Addiction, Lancet **1**:592-594, 1947.

78. Rackemann, F. M.: New Concepts of Causes of Asthma, J. Michigan M. Soc. **46**:328-330, 1947.

79. Cohen, S., and Wolf, H. L.: Studies of the Autonomic Nervous System in "Atopic" Individuals, J. Allergy **18**:391-396, 1947.

80. Swanton, C.: Asthma and Other Psycho-Physical Interrelations, M. J. Australia **1**:138-145, 1947.

81. Jimenez, Diaz, C.; Lahoz, C., and Canto, G.: The Allergens of Mill Dust: Asthma in Millers, Farmers and Others, Ann. Allergy **5**:519-525, 1947.

(beetles), and, more rarely, Acarina, flour and substances similar to the allergens of house dust.

In a further review of flour allergy, Schwartz [82] gives an account of 35 cases. Tests showed reactions to oats in 23, to rye in 22, to wheat in 19 and to barley in 18. Of 12 patients tested, 6 gave positive and 6 negative reactions to administration of potassium bromide and 5 positive and 7 negative reactions to monochloramine. Forty-six per cent of the series reported allergic disease in the family, and 2 of them had other allergies. The sensitization time for the group is given as follows: In a series of 23 patients with bronchial asthma and vasomotor rhinitis, the average was 15.8 years for the asthma and 8.4 years for the rhinitis. For 10 patients with asthma alone the average was 15.7 years, and for 2 patients with vasomotor rhinitis alone it was 11.0 years. Desensitization treatment in this group is discussed, and it is emphasized that flour allergy is an occupational disease.

A rather extensive series of papers by various authors appeared under the title of "Mold Fungi in the Etiology of Respiratory and Allergic Diseases." In this group, Sellers and McKenzie [83] show that in West Texas molds are present throughout the year. In a series of 392 patients with inhalant allergies, 174 gave definite reactions to one or more mold extracts, and 33 reacted only to molds. Mold allergy was found to be especially prevalent in the age group of 1 to 20 years. Desensitization treatment was considered worth while.

Dutton [84] found evidence of infection with various nonpathogenic fungi in the bronchial secretions of a small group of persons with asthma and obtained positive reactions to intradermal and scratch tests with extracts of these fungi in some of the patients. Appropriate hyposensitization resulted in improvement of symptoms, which is said to have been striking in a few patients with no other sensitizations. Prince, Tatge and Morrow [85] report on the properties of extracts of molds made by various methods and tested on patients by a number of observers.

Morrow [86] reports a large series of observations on the occurrence of molds in various parts of the country. In particular, results from

82. Schwartz, M.: Flour Allergy, J. Allergy **18**:341-350, 1947.

83. Sellers, E. D., and McKenzie, E.: Mold Fungi in the Etiology of Respiratory Allergic Diseases: VIII. Mold Allergy in West Texas—Clinical Observations, Ann. Allergy **5**:455-457, 1947.

84. Dutton, L. O.: Mold Fungi in the Etiology of Respiratory Allergic Diseases: VI. Intrinsic Fungus Factors in Relation to Asthma, Ann. Allergy **5**: 439-441, 1947.

85. Prince, H. E.; Tatge, E. G., and Morrow, M. B.: Mold Fungi in the Etiology of Respiratory Allergic Diseases: V. Further Studies with Mold Extracts, Ann. Allergy **5**:434-438, 1947.

86. Morrow, M. B.: Mold Fungi in the Etiology of Respiratory Allergic Diseases: VII. Further Survey Studies, Ann. Allergy **5**:442-454, 1947.

Buffalo; Decatur, Ill.; Memphis, Tenn.; Galveston, Texas, and Pittsburgh are presented. Ten species seemed to be the dominant ones for all stations. These included Alternaria, Homodendrum, Penicillium, Aspergillus, Pullularia, Torula, Fusarium, Trichoderma and two organisms described as a sterile pale species and a sterile dark species.

Deamer and Graham [87] report a twelve month study in San Francisco and report no notable seasonal variation in atmospheric molds in that area.

Durham [88] has continued his work on volumetric studies of atmospheric allergens. He describes the methods used and gives an extensive list of resulting figures.

Hansen-Pruss and Leeper [89] emphasize the need of a variety of methods for demonstration of suspected drug sensitivity, which in many cases might be impossible by a single method. They list the variety of tests available under the following headings: (1) tests using the pure, unaltered drug as an antigen (patch test, intradermal test, tongue test, buccal mucous membrane test, conjunctival test, leukopenic test, readministration); (2) tests using a combination of the drug and serum protein (drug and serum in vitro and in vivo); (3) passive transfer tests (Prausnitz-Küstner test, oral and intravenous use of antigen), and (4) miscellaneous tests (blister fluid, use of fluid and drug as antigen for intravenous test, use of other body fluids and exudates).

Dragstedt [90] points out the characteristics of true allergic reactions to drugs. Thus, reactions characterized by asthma, migraine, dermatitis, angioneurotic edema or urticaria probably are allergic. A history of a sensitizing administration of the drug is suggestive, and true allergy is indicated when the reaction is alleviated by such drugs as epinephrine and diphenhydramine hydrochloride (benadryl hydrochloride®). Acute yellow atrophy, for instance, is probably not an allergic reaction, while granulocytopenia may or may not be.

Wright [91] has found that nasal sensitivity, manifested by nasal congestion, can be produced by vasoconstrictors, the synthetic ones in particular. Relief in such cases is obtained promptly by discontinuance of the drug which is at fault.

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87. Deamer, W. C., and Graham, H. W.: Respiratory Mold Allergy, California Med. **66**:289-292, 1947.

88. Durham, O. C.: The Volumetric Incidence of Atmospheric Allergens: V. Spot Testing in the Evaluation of Species, J. Allergy **18**:231-238, 1947.

89. Hansen-Pruss, O. C., and Leeper, W. E.: Methods for the Objective Demonstration of Suspected Drug Sensitivity, Ann. Allergy **5**:541-545, 1947.

90. Dragstedt, C. A.: Idiosyncrasy to Drugs, J. A. M. A. **135**:133-136 (Sept. 20) 1947.

91. Wright, R. W.: Nasal Sensitivity to Vasoconstrictors, Arch. Otolaryng. **46**:330-334 (Sept.) 1947.

Ellis [92] has found that the thiosalicylic radical is the usual sensitizing factor in merthiolate.® He adds that 50 per cent of the merthiolate®-sensitive group were also sensitive to the mercury radical.

Sensitivity to acetylsalicylic acid (aspirin®) was found in 45 persons with chronic asthma by Friedlaender and Feinberg,[93] who believe that it indicates the likelihood of sensitivities to other simple chemical substances. The patients referred to were chiefly in the middle age group.

Instances of other etiologic factors reported include a case of asthma due to ingestion of tragacanth U. S. P. (Brown and Crepea [94]) and a case of sudden collapse in a young man following the intramuscular administration of 50 mg. of thiamine hydrochloride (Shapero and Gwinner [95]). A fatality following a second spraying of the nose, pharynx and trachea with procaine hydrochloride is reported by Ahroon,[96] who states that death may have been due to aspiration, concentration of the solution by evaporation or allergy.

Hampton [97] reports 2 cases of anaphylactic shock following parenteral injection of typhus vaccine prepared from chick embryos, and Curphey [98] cites a fatal reaction in a 3½ year old girl to influenza virus vaccine.

Reports on the role of the sulfonamide drugs and antibiotics in the etiology of allergies continue to accumulate. The possible relation of the sulfonamide drugs to periarteritis nodosa suggested by Harbert and McPherson [42] and Goldsmith [43] and a case of glaucoma following sulfathiazole treatment (Fritz and Kesert [39]) have already been referred to.

Sulzberger and his associates [99] have carefully studied the sensitization produced by topical application of the sulfonamide drugs in the form of creams in 254 men under standard conditions. They conclude that the sulfonamide compounds fall into the following order of increasing sensitizing potentials corresponding to their water solubilities:

92. Ellis, F. A.: The Sensitizing Factor in Merthiolate, J. Allergy **18**:212-213, 1947.

93. Friedlaender, S., and Feinberg, S. M.: Aspirin Allergy: Its Relationship to Chronic Intractable Asthma, Ann. Int. Med. **26**:734-740, 1947.

94. Brown, E. B., and Crepea, S. B.: Allergy (Asthma) to Ingested Gum Tragacanth, J. Allergy **18**:214-215, 1947.

95. Shapero, W., and Gwinner, M. W.: Sensitivity to Thiamine Hydrochloride: Report of a Case, Ann. Allergy **5**:349-352, 1947.

96. Ahroon, W. A.: Report of a Death from Pontocaine Hydrochloride, Laryngoscope **56**:320-323, 1946.

97. Hampton, S. F.: Anaphylactic Shock in Egg-Sensitive Individuals Following Vaccination with Typhus Vaccine, J. Lab. & Clin. Med. **32**:109-117, 1947.

98. Curphey, T. J.: Fatal Reaction Due to Influenza Vaccine, J. A. M. A. **133**:1062-1064 (April 12) 1947.

99. Sulzberger, M. B.; Fanot, A.; Baer, R. L., and Lowenberg, C.: Sensitization by Topical Application of Sulfonamides, J. Allergy **18**:92-103, 1947.

sulfadiazine, sulfathiazole, sulfanilamide and sodium sulfadiazine. Cross sensitization was obtained with a significant frequency, and superficial damage to the skin at the site of topical application greatly increased the incidence of sensitization. In conclusion, they warn that sensitizing external application of sulfonamide drugs results in increased danger of both cutaneous and general reactions from the subsequent oral administration of the same or a related drug.

A case of sensitization to sulfadiazine, in which passive transfer was successfully carried out, is reported by Whittemore and de Gara.[100] Sensitization in this case had apparently occurred during previous treatment for furunculosis. Sherman and Cooke [101] also proved the existence of antibodies by passive transfer tests in patients with sensitivity to sulfadiazine.

Friedman [102] reports cases of sulfadiazine poisoning with pemphigoid lesions.

Ballenger,[103] on the other hand, found an incidence of sensitivity of less than 0.5 per cent after application of sulfathiazole, sulfanilamide and sulfadiazine powers by insufflation to the mucous membrane of the upper respiratory tract in 1,500 patients with various acute infections of the nose and throat.

Hopkins and Lawrence [104] found that in a series of patients treated with penicillin for cutaneous infections, 11 per cent had urticaria, erythematovesicular lesions or dermatitis and that 13 per cent of patients treated with penicillin ointment were sensitized, as shown by patch tests. Sensitization was demonstrable in 27 per cent with eczematoid lesions. There were, however, no severe generalized reactions, and sensitization was often localized and transient. Less than 1 per cent of patients showed sensitization sufficiently severe to preclude later systemic treatment with penicillin.

Three cases of the delayed serum type of reaction to penicillin occurring in one family are reported by Kendig and Toone.[105] The

100. Whittemore, A. L., and de Gara, P. F.: Sulfadiazine Sensitivity: An Unusual Case with Successful Passive Transfer, J. Allergy **18**:382-384, 1947.

101. Sherman, W. B., and Cooke, R. A.: Sulfadiazine Sensitivity with Demonstrable Skin Sensitizing Antibody in the Serum, Am. J. Med. **2**:588-593, 1947.

102. Friedman, B.: Therapeutic Sulfadiazine Poisoning, with Pemphigoid Lesions: Conjunctival Changes, Arch. Ophth. **38**:796-805 (Dec.) 1947.

103. Ballenger, H. C.: Sensitivity from Insufflation of the Powdered Sulfonamide Compounds in Acute Infections of the Nose and Throat, Arch. Otolaryng. **46**:52-57 (July) 1947.

104. Hopkins, J. G., and Lawrence, H.: Sensitization to Penicillin, J. Allergy **18**:251-262, 1947.

105. Kendig, E. L., and Toone, E. C.: Delayed Serum Type of Reaction to Penicillin: Report of Three Cases in One Family, South. M. J. **40**:697-698, 1947.

reactions were all moderate in form, with malaise, arthralgia and urticaria.

Mears and State [106] describe a case in which local use of penicillin in a hypersensitive patient produced a rapid inflammatory and necrotizing lesion resembling Arthus' phenomenon. The solution in this case was used on an open wound.

Brown [107] reports a case of glossodynia and exfoliation of papillary filaments after the oral administration of penicillin.

A case of urticaria and nasal congestion and another of dermatitis, nasal congestion and photophobia in nurses handling penicillin are presented by MacInnis.[108] One of these nurses gave a history of penicillin sensitivity following treatment, but the other had no history of ever receiving penicillin.

Barefoot and Orlandsky [109] feel that some reactions to penicillin may be due to impurities, and they cite the case of a patient who gave no reaction to crystalline penicillin after having had repeated reactions to the crude drug.

Hewitt and Curry [110] have found a histamine-like substance in streptomycin which produced typical effects, relieved by diphenhydramine hydrochloride (benadryl hydrochloride®), in a group of patients. They feel that the evidence indicates that histamine may be a contaminant in impure streptomycin.

ANTIHISTAMINIC SUBSTANCES

A general review of the pharmacology of the antihistaminic drugs is published by Loew,[111] and another, briefer, general discussion, by Arbesman.[112] Arbesman points out that these drugs owe their effectiveness to the altering of the end product of the allergen-antibody

106. Mears, F. B., and State, D.: Arthus Phenomenon Induced by Local Application of Penicillin, Minnesota Med. **30**:517-518, 1947.

107. Brown, R. L.: Glossodynia and Exfoliation of Papillae Filaments After Oral Administration of Penicillin, Arch. Otolaryng. **45**:355-356, 1947.

108. MacInnis, K. B.: Allergic Reactions from Handling Penicillin, Ann. Allergy **5**:102-104, 1947.

109. Barefoot, S. W., and Orlandsky, S.: Report of a Patient Tolerating Crystalline Penicillin Without Reaction After Repeated Reactions to Crude Penicillin, North Carolina M. J. **8**:82-83, 1947.

110. Hewitt, W. L., and Curry, J. J.: Pharmacodynamic Effect in Man of Streptomycin Containing a Histamine-Like Factor, J. Lab. & Clin. Med. **32**: 41-46, 1947.

111. Loew, E. R.: Pharmacology of Antihistamine Compounds, Physiol. Rev. **27**:542-573, 1947.

112. Arbesman, C. E.: The Pharmacology, Physiology and Clinical Evaluation of the New Antihistaminic Drugs (Pyribenzamine and Benadryl), New York State J. Med. **47**:1775-1781, 1947.

reaction, which is histamine. Other investigators, however, are in doubt whether histamine is actually the mediating substance responsible for allergic reactions, as demonstrated by studies with antihistaminic drugs. Last and Loew,[113] working with rabbits, found that the effect of injected histamine in increasing capillary permeability, as shown by the trypan blue test, was prevented or diminished by administration of diphenhydramine and pyranisamine (neo-antergan®). They found, however, that intradermal injections of horse serum and other substances produce a trypan blue reaction not modified by diphenhydramine (benadryl®) and therefore conclude that histamine is not a major factor in the production of such increased capillary permeability. They do not feel, however, that histamine can be excluded entirely in antigen-antibody reactions.

Dreisbach[114] failed to obtain protection against the development of the Arthus type of cutaneous sensitivity induced by penicillin in horse serum with diphenhydramine (benadryl hydrochloride®) or tripelennamine hydrochloride (pyribenzamine hydrochloride®), even when they were mixed with the antigen given. When mixed with histamine, they did prevent reactions. He suggests that the clinical effects of these drugs may be subjective and dependent on central and peripheral depression.

Schiller and Lowell[115] measured changes in vital capacity of 3 asthmatic patients subjected to the inhalation of aerosolized pollen extracts and to solutions of histamine and acetyl-beta-methylcholine. The effects of various drugs in modifying responses were studied, and it was found that neither atropine nor tripelennamine hydrochloride influenced them. They conclude that neither acetylcholine nor histamine is a determining factor in the production of pollen-induced asthmatic attacks.

Levy and Seabury[116] made spirometric studies on 16 patients with asthma and found that at thirty minutes and one hour after the oral administration of 100 mg. of diphenhydramine hydrochloride there were

113. Last, M. R., and Loew, E. R.: Effect of Antihistamine Drugs on Increased Capillary Permeability Following Intradermal Injections of Histamine, Horse Serum and Other Agents in Rabbits, J. Pharmacol. & Exper. Therap. **89**: 81-91, 1947.

114. Dreisbach, R. H.: Failure of Benadryl and Pyribenzamine in Experimental Skin Sensitization to Penicillin and Horse Serum, J. Allergy **18**:397-401, 1947.

115. Schiller, I. W., and Lowell, F. C.: The Effect of Drugs in Modifying the Response of Asthmatic Subjects to Inhalation of Pollen Extracts as Determined by Vital Capacity Measurements, Ann. Allergy **5**:564-566, 1947.

116. Levy, L., and Seabury, J. H.: Spirometric Evaluation of Benadryl in Asthma, J. Allergy **18**:244-250, 1947.

no consistent changes in vital capacity, tidal air, minute ventilation, expiratory differential (the value in centimeters of air of the difference between the expiratory level of a vital capacity breath and the expiratory level of the preceding normal breath), respiratory rate or degree of emphysema. In 3 of 6 patients deriving subjective relief, the spirometric data were opposed to the subjective report. The spirometric measurements were increased with no increases in respiratory rate, in 5 patients given epinephrine and aminophylline. One patient went into status asthmaticus after administration of diphenhydramine hydrochloride (benadryl®). Levy and Seabury believe that there are two phases in the subsidence of asthma separated by a variable interval: (1) the initial alleviation of bronchial spasm and (2) the return of the respiratory effort to a resting level.

Campbell, Baronofsky and Good [117] found that, while diphenhydramine hydrochloride protected rabbits against histamine shock, it did not protect them against anaphylactic shock induced with egg white. Guinea pigs actively sensitized to egg white were not protected against anaphylaxis induced by intraperitoneal administration of the antigen.

On the other hand, Marcus [118] concludes that the protective effect of tripelennamine hydrochloride and diphenhydramine hydrochloride is quantitatively related to administered doses of egg white and that these results are important evidence that histamine plays a major role in anaphylaxis.

Mayer [119] is also of the opinion that data derived from experiments with antihistaminic substances support the theory that histamine (or a histamine-like substance) is an important factor in anaphylaxis and in other manifestations not previously associated with histamine.

Mayer, Brousseau and Eisman [120] protected guinea pigs against histamine intoxication and anaphylactic shock with administration of tripelennamine hydrochloride inhaled in the form of an aerosol. The possible therapeutic value of tripelennamine hydrochloride administered in this way is mentioned, since the effective doses are so small that side effects should be kept at a minimum.

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117. Campbell, B.; Baronofsky, I. D., and Good, R. A.: Benadryl: Effects on Anaphylactic and Histamine Shock in Rabbits and Guinea Pigs, Proc. Soc. Exper. Biol. & Med. **64**:281-283, 1947.

118. Marcus, S: Quantitative Aspects of Inhibition of Anaphylactic Shock in Guinea Pigs, Proc. Soc. Exper. Biol. & Med. **66**:181-184, 1947.

119. Mayer, R. L.: Antihistaminic Substances and Experimental Sensitization, Ann. Allergy **5**:113-125, 1947.

120. Mayer, R. L.; Brousseau, D., and Eisman, P. C.: Pyribenzamine Aerosol Inhalation: Influence on Anaphylaxis, Proc Soc. Exper. Biol. & Med. **64**: 92-96, 1947.

Gelvin, Elias and McGavack [121] found that diphenhydramine hydrochloride had no effect on the permeability of the meningeal capillaries and produced no alteration in the cerebrospinal fluid. They therefore conclude that any effects following the administration of diphenhydramine hydrochloride to human subjects are due to other modes of action of the drug.

Rose, Feinberg, Friedlaender and Feinberg [122] studied the comparative antianaphylactic properties of several of the antihistamine drugs, including diphenhydramine hydrochloride, tripelennamine hydrochloride, dimethyl aminoethylbenzyl aniline (antergen®) and pyranisamine (neoantergan®), all of which showed essentially similar effects against a single lethal dose of histamine. It was further found that amounts of these drugs which had no effect on the contractions of a sensitized strip of guinea pig intestine due to histamine inhibited anaphylactic contractions.

Further demonstrations of the antihistaminic activity of diphenhydramine hydrochloride are reported by Cohen and co-workers,[123] who show the effectiveness of the drug in raising the histamine threshold of the human skin, and that of tripelennamine hydrochloride, by Aaron and Abramson,[124] who demonstrated inhibition of histamine wheal formation.

Mayer and Kull [125] showed that the effect of hyaluronidase in increasing allergic inflammatory lesions of the skin was counteracted by tripelennamine hydrochloride.

Goodman and Coonrad [126] were able to prevent headache induced with histamine phosphate in all of a group of 34 persons subject to various types of headache with 100 mg. of diphenhydramine hydrochloride given orally one hour before the experiment. Of 54 patients seen primarily because of headache, histamine phosphate reproduced

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121. Gelvin, E. P.; Elias, H., and McGavack, T. H.: The Effect of Dimethylaminoethyl Benzhydryl Ether Hydrochloride (Benadryl) upon Permeability of Meningeal Capillaries, J. Pharmacol. & Exper. Therap. **89**:101-105, 1947.

122. Rose, J. M.; Feinberg, A. R.; Friedlaender, S., and Feinberg, S. M.: Histamine Antagonists: VII. Comparative Antianaphylactic Activity of Some New Antihistaminic Drugs, J. Allergy **18**:149-155, 1947.

123. Cohen, M. B.; Friedman, H. J.; Zoris, J.; Burke, M., and Abraham, L. E.: The Effect of Beta-Dimethylaminoethyl-Benzhydryl-Ether-Hydrochloride on the Histamine Threshold of the Human Skin, J. Allergy **18**:32-35, 1947.

124. Aaron, T. H., and Abramson, H. A.: Inhibition of Histamine Whealing in Human Skin by Pyribenzamine Hydrochloride Using Iontophoretic Technique, Proc. Soc. Exper. Biol. & Med. **65**:272-273, 1947.

125. Mayer, R. L., and Kull, F. C.: Influence of Pyribenzamine and Antistine on the Action of Hyaluronidase, Proc. Soc. Exper. Biol. & Med. **66**:392-398, 1947.

126. Goodman, E. G., and Coonrad, R. W.: Prophylactic Effect of Benadryl on Experimental Histamine Headache, J. Allergy **18**:402-407, 1947.

symptoms in 31. Of 18 patients given diphenhydramine hydrochloride before a subsequent injection of histamine phosphate, the headache was prevented in 15 and was mild in 1. Results were questionable in 2 others.

Perry and Horton [127] found that 12.5 to 25 mg. of tripelennamine hydrochloride given intravenously almost entirely prevented headaches following the intravenous administration of 0.05 mg. of histamine base. They obtained no consistent effect of tripelennamine hydrochloride on the increase of gastric acidity induced with histamine. They do not recommend the intravenous administration of tripelennamine hydrochloride clinically because of side effects.

Using electroalgesimetric determinations, Leavitt and Code [128] showed that diphenhydramine hydrochloride has anesthetic potencies in dilutions of 1 : 500, 1 : 1,000, 1 : 5,000, 1 : 10,000 and 1 : 20,000, equivalent, respectively, to solutions of procaine hydrochloride of 1 : 200, 1 : 400, 1 : 800, 1 : 1,600 and 1 : 3,200. In concentrations greater than 1 : 500, diphenhydramine hydrochloride proved to be extremely irritating and caused necrosis and ulceration in 4 of 10 subjects.

Of other antihistaminic drugs, one, thonzylamine hydrochloride (neohetramine hydrochloride*; N,N-dimethyl-N′-[*p*-methoxybenzyl]-N′-[2-pyrimidyl]-ethylenediamine hydrochloride), was investigated by Reinhard and Scudi [129] and Dreyer and Harwood.[130] Reinhard and Scudi, on the basis of intraperitoneal tests on mice, found it to be half as toxic as other antihistaminic drugs. Marked activity against the effects of histamine on bronchioles and capillaries was demonstrated, but quantitative estimates of the effect were said to vary with the method of testing. The drug protected guinea pigs against anaphylactic shock, and therapeutic value is suggested. Dreyer and Harwood [130] found thonzylamine hydrochloride to be highly antihistaminic and to possess atropine-like properties.

The compound N-(2-pyridyl)-N-(2-thenyl)-N′, N-dimethylethylendiamine hydrochloride, designated as 01013, was found by Lee, Din-

127. Perry, E. L., and Horton, B. T.: Use of Pyribenzamine in Prevention of Histamine-Induced Gastric Acidity and Headache and in Treatment of Hypersensitiveness to Cold, Am. J. M. Sc. **214**:553-558, 1947.

128. Leavitt, M. D., and Code, C. F.: Anesthetic Action of Beta Dimethylaminoethyl Benzhydryl Ether Hydrochloride (Benadryl) in the Skin of Human Beings, Proc. Soc. Exper. Biol. & Med. **65**:33-38, 1947.

129. Reinhard, J. F., and Scudi, J. V.: Pharmacological Characteristics of Neohetramine, a New Antihistaminic Drug, Proc. Soc. Exper. Biol. & Med. **66**: 512-515, 1947.

130. Dreyer, N. B., and Harwood, D.: Pharmacological Characteristics of Neohetramine, a New Antihistaminic Drug, Proc. Soc. Exper. Biol. & Med. **66**: 515-516, 1947.

widdie and Chen [131] to be a potent antihistaminic agent through experiments with guinea pigs and cats and on guinea pig intestine. It is thought to be of possible value in the treatment of hay fever. Feinberg and Bernstein [132] also demonstrated its antihistaminic properties and found that it produces fairly common side reactions, chiefly sedation. These effects are stated to be about equal to those of tripelennamine hydrochloride and definitely less marked than those of diphenhydramine hydrochloride. Clinical tests indicate an effectiveness approaching, but not equaling, that of tripelennamine hydrochloride.

Halpern and his co-workers (Halpern [133] and Hamburger, Halpern and de Bray [134]) studied a new series of antihistaminic drugs derived from thiodiphenylamine. Two of them (3015 R.P. and 3277 R.P.) were found to be powerfully antihistaminic. The latter is said to protect guinea pigs against 1,500 lethal doses of histamine, and 0.1 mg. protects against fatal anaphylactic shock. The drugs were found to be less toxic and more active than previous antihistaminic substances.

A large group of clinical reports on the antihistaminic drugs appeared during 1947. A majority of these reports deal with tripelennamine and diphenhydramine. These will be considered first, and reports on other drugs will be covered later.

Reinstein and McGavack [135] outline a technic for the administration of diphenhydramine hydrochloride, beginning with an initial dose of 150 mg. daily. The dose is increased to 600 mg. over a ten day period, and the increase is stopped as soon as improvement begins. Administration of the dose attained is then continued for two weeks and then stopped. If symptoms recur, treatment is resumed. In children a similar program is followed with a maximum dose of 2 mg. per pound (0.5 Kg.) of weight. It is suggested that side reactions be ignored unless they are severe.

131. Lee, H. M.; Dinwiddie, W. G., and Chen, K. K.: The Antihistamine Action of N-(2-Pyridyl)-N-(2-Thenyl)-N', N'-Dimethylethylendiamine Hydrochloride, J. Pharmacol. & Exper. Therap. **90**:83-87, 1947.

132. Feinberg, S. M., and Bernstein, T. B.: Histamine Antagonists: VIII. N-(*a*-Pyridyl)-N-(*a*-Thienyl)-N': N-Dimethylethylendiamine, a New Antihistaminic Compound; Experimental and Clinical Experiences, J. Lab. & Clin. Med. **32**:1370-1373, 1947.

133. Halpern, B. N.: Experimental Research on a New Series of Chemical Substances with Powerful Antihistaminic Activity: The Thiodiphenylamine Derivatives, J. Allergy **18**:263-272, 1947.

134. Hamburger, J.; Halpern, B., and deBray, C.: Cited in Research on a New Series of Synthetic Antihistaminics, Foreign Letters (Paris), J. A. M. A. **133**: 960 (March 29) 1947.

135. Reinstein, H., and McGavack, T. H.: Benadryl: Technique for Its Administration, New York State J. Med. **47**:1601-1603, 1947.

Goldstein [136] reports on 79 allergic patients treated with diphenhydramine hydrochloride, 71 of them between the ages of 2 and 16 years. He obtained excellent improvement in 76 per cent, good improvement in 10 per cent, fair to poor results in 6 per cent and no improvement in 8 per cent.

Pennock [137] had poor results with administration of diphenhydramine hydrochloride in his series of cases and feels that the dose used may have been inadequate.

In the treatment of hay fever Logan [138] reports some benefit in 11 of 13 children receiving doses of 10 to 450 mg. of diphenhydramine hydrochloride per day. Lockey [139] found diphenhydramine hydrochloride valuable in the treatment of hay fever, and similar results are reported by Barnett and his co-workers.[140] Farmer and Spickschen [141] obtained good results in 23 of 45 cases, fair results in 11 cases and poor results in 11 cases. Walton and Kristjansson-MacDonell [142] obtained marked benefit with diphenhydramine hydrochloride in 16 of 18 cases of hay fever.

Loveless [143] has found both diphenhydramine and tripelennamine valuable in the treatment of hay fever, and in another paper (Loveless and Brown [144]) reports that the two drugs were about equally effective in 23 of 33 cases. Of the remaining 10 cases, response was better to tripelennamine hydrochloride in 5 and to diphenhydramine hydrochloride in 5.

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136. Goldstein, H.: Benadryl Treatment of Allergic Patients: Seventy-Nine Cases, J. Pediat. **30**:41-44, 1947.

137. Pennock, L. L.: Benadryl: Clinical Experiences in Allergic States, Pennsylvania M. J. **50**:609-613, 1947.

138. Logan, G. B.: The Use of Benadryl in the Treatment of Certain Allergic Diseases of Children, Ann. Allergy **5**:105-112, 1947.

139. Lockey, S. D.: Benadryl: A Clinical Evaluation Based on One Hundred and Seventy-One Cases Studied, Ann. Allergy **5**:420-425, 1947.

140. Barnett, S. E.; Goss, S. B.; Fox, L., and Cohen, H. H.: Benadryl in Hay Fever, Asthma, Vasomotor Rhinitis, and in Mixed Allergic Groups: Further Observations, Eye, Ear, Nose & Throat Monthly **26**:199-205, 1947.

141. Farmer, L., and Spickschen, H.: Benadryl: Synthetic Antihistamine Compound for Symptomatic Treatment of Allergic Diseases, New York State J. Med. **47**:1119-1121, 1947.

142. Walton, C. H. A., and Kristjansson-MacDonell, J. A.: Antihistamine Drugs, Canad. M. A. J. **56**:162-169, 1947.

143. Loveless, M. H.: Therapeutic and Side Effects of Pyribenzamine and Benadryl, Am. J. Med. **3**:296-308, 1947.

144. Loveless, M. H., and Brown, H.: A Comparison Between the Clinical Effects of Pyribenzamine and Those of Benadryl, New England J. Med. **237**: 501-504, 1947.

Engelsher [145] made three day trial treatments with tripelennamine hydrochloride and diphenhydramine hydrochloride on 193 patients with hay fever or asthma, or both. In 127 patients symptoms were unchanged, and the drying effect produced cough, and even asthma, in some patients who had had no previous thoracic symptoms. He feels that these drugs are far less valuable than standard medication.

Wagner [146] emphasizes the value of diphenhydramine and tripelennamine in the symptomatic relief of allergic conditions and reports 38 cases of hay fever treated with these drugs, with relief in 24, partial relief in 3 and no relief in 11. Of 44 patients under hyposensitization treatment who had symptoms, 38 were relieved with antihistaminic drugs.

Henderson and Rose [147] had their best results with tripelennamine hydrochloride in treatment of hay fever, with benefit to 47 of 61 patients. Similar results are reported by Levin,[148] who obtained improvement in 18 of 28 patients. Levin feels that results with diphenhydramine hydrochloride are slightly better than those with tripelennamine hydrochloride.

Fuchs, Schulman and Strauss [149] consider tripelennamine hydrochloride valuable for the relief of symptoms of hay fever but point out that relief is temporary and in no way concerned with the antigen-antibody reaction. They have found tripelennamine hydrochloride particularly useful when administered prior to the injection treatment, since larger doses are made possible and maximum doses almost twice those otherwise tolerated can be used.

Leibowitz, Kurtz and Schwartz [150] obtained relief in 9 of 21 patients with hay fever treated with tripelennamine hydrochloride alone, in 35 of 47 treated with tripelennamine hydrochloride and desensitization and in 10 of 18 with desensitization alone. Arbesman, Cohen and Osgood [151] report that tripelennamine hydrochloride and injection therapy gave

145. Engelsher, D. L.: Antihistaminic Drugs in Asthma and Hay Fever, New York State J. Med. **47**:1696, 1947.

146. Wagner, H. C.: Symposium on Advances in Clinical Medicine: Use of New Antihistaminic Substances (Especially Benadryl and Pyribenzamine) in Allergic Disorders, M. Clin. North America **31**:43-51, 1947.

147. Henderson, A. T., and Rose, B.: Pyribenzamine in the Treatment of Allergy, Canad. M. A. J. **57**:136-140, 1947.

148. Levin, S. J.: Clinical Results with Pyribenzamine, J. Michigan M. Soc. **46**:85-86, 1947.

149. Fuchs, A. M.; Schulman, P. M., and Strauss, M. B.: Clinical Studies with Pyribenzamine (N'Pyridil-N'-Benzyl-N-Dimethylendiamine) in Hay Fever, J. Allergy **18**:385-390, 1947.

150. Leibowitz, H.; Kurtz, I. M., and Schwartz, E.: Pyribenzamine in the Treatment of Hay Fever, New York State J. Med. **47**:989-991, 1947.

151. Arbesman, C. E.; Cohen, V. L., and Osgood, H.: Pyribenzamine Versus Specific Hyposensitization in the Treatment of Pollinosis: A Comparative Study, J. Allergy **18**:311-324, 1947.

relief of symptoms in 95 of 242 patients. In clinic patients results obtained with either tripelennamine hydrochloride or specific hyposensitization were about equal.

In treatment of vasomotor rhinitis Lockey [139] reports valuable results with diphenhydramine hydrochloride, and Logan [138] obtained some benefit in 16 of 18 children with the drug.

Tripelennamine hydrochloride and/or diphenhydramine hydrochloride has been reported to be of value in treatment of urticaria by Logan,[138] Lockey,[139] Loveless [143] and Loveless and Brown.[144]

Peterson and Bishop [152] completely controlled serum sickness in 9 of 10 children, from 2 months to 8 years of age, with doses of 8 mg. of diphenhydramine hydrochloride per pound of body weight. The tenth child was much benefited.

Perry and Horton [127] found tripelennamine hydrochloride of some value in 3 cases of hypersensitiveness to cold.

Lockey [139] found diphenhydramine of no value in treatment of migraine, seasickness, dysmenorrhea, or erythema nodosum (1 case) and of little value in treatment of atopic eczema.

In treatment of bronchial asthma, reports are consistently unfavorable, or at best inconclusive. McGavack, Elias and Boyd [153] consider diphenhydramine a valuable antihistaminic agent and a potent sedative but report only fair results in the treatment of asthma. Lockey [139] found that the drug had limited value in some cases of intractable asthma but that it did not relieve the asthma of most patients. Barnett, Goss, Fox and Cohen [140] had poor results in 3 cases of severe asthma. Logan [138] reports some degree of benefit in 6 of 7 children with a single attack of asthma and in 16 of 17 children with multiple attacks. Feinberg and Friedlaender [154] found tripelennamine only moderately effective in treatment of bronchial asthma, while Loveless and Brown [144] report that mild bronchospasm was relieved but that severe asthma was not.

It is generally agreed that both tripelennamine and diphenhydramine frequently produce troublesome side reactions and that these may in some degree limit the value of the drugs. Gruhzit and Fisken [155]

152. Peterson, J. C., and Bishop, L. K.: Treatment of Serum Sickness with Benadryl, J. A. M. A. **133**:1277-1280 (April 26) 1947.

153. McGavack, T. H.; Elias, H., and Boyd, L. J.: Pharmacologic and Clinical Experiences with Dimethylaminoethyl Benzhydryl Ether Hydrochloride (Benadryl), Am. J. M. Sc. **213**:418-434, 1947.

154. Feinberg, S. M., and Friedlaender, S.: Histamine Antagonists: Pyribenzamine in Symptomatic Treatment of Allergic Manifestation, Am. J. M. Sc. **213**:58-60, 1947.

155. Gruhzit, O. M., and Fisken, R. A.: A Toxicologic Study of Two Histamine Antagonists of the Benzhydryl Alkamine Ether Group, J. Pharmacol. & Exper. Therap. **89**:227-251, 1947.

investigated the basic effects of diphenhydramine hydrochloride and another antihistaminic drug, A-446 (2-morpholinoethyl benzhydryl ether hydrochloride). They found that both drugs were well tolerated in appropriate doses for six months. Toxic effects noted included excitement, spastic ataxia, extreme irritability, painful hyperesthesia, convulsive attacks and respiratory and myocardial embarrassment. Barbiturates controlled the excitement, but not respiratory or cardiac depression.

Goldstein [136] added 25 per cent of pyridoxine hydrochloride to diphenhydramine and found that most side effects were overcome. In 2 cases in which the effect was not obtained, 50 mg. of nicotinamide was immediately successful.

Of Pennock's [137] series of patients, 57 per cent had side reactions to diphenhydramine hydrochloride and 5 per cent had to discontinue use of the drug. There was, however, no instance of addiction, cumulative effect, development of tolerance, sensitization or serious toxic effect.

Farmer and Spickschen [141] found side reactions in one third of 45 patients with hay fever treated with diphenhydramine hydrochloride. Walton and Kristjanssen-MacDonell [142] encountered side reactions in 14 of 18 cases of hay fever and feel that remote toxic effects must be considered and that allergy to antihistaminic drugs is a possibility. Side reactions to diphenhydramine are also reported by McGavack, Elias and Boyd [158] and by Logan.[138] Loveless and Brown,[144] in comparing diphenhydramine with tripelennamine, report that side effects (mostly sedation) occurred in 61 per cent of patients treated with diphenhydramine and in 20 per cent treated with tripelennamine. Wagner [146] and Levin [148] also report side reactions with tripelennamine and diphenhydramine, and Levin has found them more frequently with the latter drug.

Henderson and Rose [147] encountered side reactions to tripelennamine, and 2 of 138 patients had to discontinue therapy. Leibowitz and his associates [150] reported side reactions in 25 of 68 patients treated with tripelennamine hydrochloride.

A number of cases of unusual and serious side reactions to diphenhydramine and tripelennamine have been reported. Harris and Shure [156] describe a case of eczematoid dermatitis following administration of tripelennamine hydrochloride. This reaction is considered allergic, since the effect is unconnected with the pharmacologic properties of the drug. Two cases of dermatitis occurring during treatment with tripelennamine, with recovery on withdrawal of the drug, are reported by

156. Harris, M. C., and Shure, N.: Eczematoid Dermatitis Following Ingestion of "Pyribenzamine Hydrochloride," N. N. R. Tablets, J. Allergy **18**:408-412, 1947.

Epstein.[157] Sternberg [158] records a case of hysteria in a young woman given a daily dose of 350 mg. of diphenhydramine hydrochloride, with recovery when the administration was stopped. Weil [159] presented a case of excitement followed by irrationality in a 3½ year old boy given diphenhydramine hydrochloride. Recovery in this case was also prompt. The case of a woman aged 26 who received 300 mg. of diphenhydramine hydrochloride over a three day period, and in whom developed palpitation, malaise, drowsiness, heartburn, nausea and, eventually, unconsciousness, is described by Geiger, Rosenfield and Hartman.[160] A case of hypertension following administration of diphenhydramine hydrochloride is reported by Gelfand,[161] and one of a prolonged reaction, still present after three months, by Schwartzberg and Willerson.[162]

Administration of tripelennamine hydrochloride was followed by granulocytopenia in a woman of 74 and was considered the probable cause in this case, reported by Blanton and Owens.[163]

In a few cases diphenhydramine hydrochloride was given in massive doses. One was that of an 18 year old girl who increased her dose to 2,000 mg. in three days after experiencing good results in hay fever and asthma. She became drowsy and irrational. The temperature, pulse and respiratory rate remained normal, and she recovered in forty-eight hours. Treatment consisted of forcing fluids, especially strong coffee (Borman [164]). Duerfeldt [165] reports the suicide of a girl aged 13 who took 30 capsules (50 mg. each) of diphenhydramine hydrochloride, and the recovery of an asthmatic patient aged 56 who misunderstood directions and took 50 similar capsules.

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157. Epstein, E.: Dermatitis Occurring During Therapy with Tripelennamine Hydrochloride ("Pyribenzamine Hydrochloride"), J. A. M. A. **134**:782 (June 28) 1947.

158. Sternberg, L.: Unusual Side Reaction of Hysteria from Benadryl, J. Allergy **18**:417, 1947.

159. Weil, H. R.: Unusual Side Effect from Benadryl, J. A. M. A. **133**: 393 (Feb. 8) 1947.

160. Geiger, J.; Rosenfield, S. Z., and Hartman, D. L.: Unusual Reaction Following Benadryl Administration, J. A. M. A. **133**:392 (Feb. 8) 1947.

161. Gelfand, H. H.: Hypertension Following Benadryl, Queries and Minor Notes, J. A. M. A. **134**:1278 (Aug. 9) 1947.

162. Schwartzberg, S., and Willerson, D.: Prolonged Reaction to Benadryl, J. A. M. A. **133**:393-394 (Feb. 8) 1947.

163. Blanton, W. B., and Owens, M. E. B., Jr.: Granulocytopenia Due Probably to "Pyribenzamine," J. A. M. A. **134**:454-455 (May 31) 1947.

164. Borman, M. C.: Danger with Benadryl of Self-Medication and Large Dosage, J. A. M. A. **133**:394-395 (Feb. 8) 1947.

165. Duerfeldt, T. H.: Acute Benadryl Poisoning, Northwest. Med. **46**:781-782, 1947.

Of the other antihistaminic drugs, one, phenindamine (thephorin®); (2-methyl-9-phenyl-2,3,4,9-tetrahydro-1-pyridindene hydrogen tartrate), was tried clinically by Reynolds and Horton,[166] who had excellent results in 17 of 22 cases of hay fever. In these 17 cases, the symptoms were moderately severe. In 2 of 4 other cases with severe symptoms 50 per cent relief was obtained. One patient had no relief, and 1 complained of drowsiness. Animal studies indicated that phenindamine is antagonistic to histamine.

Kallós[167] found antistin (2-phenylbenzylaminomethyl-imidazolin), a drug little used in the United States, valuable in the treatment of allergic dermatosis, serum disease, Ménière's syndrome, Horton's syndrome (histamine cephalalgia) and in some cases of seasonal perennial allergic rhinitis.

The drug called 01013 by Lee and co-workers[181] was found most effective by Pierce and Mothersill[168] in the treatment of rhinitis due to pollen, acute urticaria and histamine-induced headache. Of 21 cases of ragweed hay fever, complete relief was obtained in 15 cases, moderate relief in 3 cases and none in 3 cases. There were 5 instances of side effects, dizziness, depression and light-headedness. A dose of 50 to 400 mg. daily was employed.

Feinberg and Bernstein[182] found the same drug a little less effective than tripelennamine hydrochloride. Side reactions occurred less frequently than with diphenhydramine and in selected persons are said to be less disturbing than those of tripelennamine.

Ratner[169] evaluates the antihistaminic drugs and their place in therapeutics and points out that histamine is not the proved cause of allergic reactions and that these drugs have not been proved to be antihistaminic. He feels that many allergic episodes are self limited and that spontaneous termination may frequently be confused with beneficial results from use of antihistaminic substances. He considers them valuable in cases of urticaria and hay fever in allaying pruritus and lacrimal and nasal discharge but points out what the literature cited indicates, namely, that they are not effective in treatment of asthma or eczema. They deserve a place as symptomatic remedies but are in no sense cures.

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166. Reynolds, J. L., and Horton, B. T.: Clinical Observations on the Use of Thephorin: A New Antihistamine Agent, Proc. Staff Meet., Mayo Clin. **22**: 574-577, 1947.

167. Kallós, P. Significance of "Histamine Antagonists" in the Treatment of Allergic Disease, J. A. M. A. **135**:315 (Oct. 4) 1947.

168. Pierce, J. D., and Mothersill, M. H.: Treatment of Allergic Symptoms with a New Antihistamine Drug, J. Indiana M. A. **40**:739-743, 1947.

169. Ratner, B.: Evaluation of Benadryl, Pyribenzamine, and Other So-Called Antihistaminic Drugs in Allergy, J. Pediat. **30**:583-602, 1947.

Waldbott [170] reviews critically the value of antihistaminic drugs in the treatment of allergies in general, and Archibald [171] considers them in this light in a review of pediatric allergy.

TREATMENT AND DRUGS OTHER THAN ANTIHISTAMINIC SUBSTANCES

Hartman [172] has investigated a new synthetic antispasmodic drug, beta-diethylaminoethyl-9,-10-dihydroanthracene-9-carboxylate hydrochloride, designated as compound 887. Basing his conclusions on trials in 90 asthmatic patients, he considers it a safe and useful remedy. It has both an antispasmodic and a sedative effect, the latter limiting its value during the day but increasing it at night. Disappearance or marked diminution of rhonchi and relief of dyspnea, with shortening of the expiratory phase and increase in vital capacity, are objective criteria used in the evaluation of treatment. Subjective criteria include diminution of wheezing, shortness of breath and coughing, relief of orthopnea, and ability to rest at night. Eighty per cent of patients with moderately severe asthma were benefited. Doses of 0.2 Gm. every four hours are said to be sufficient in most cases. A few patients experienced side effects, including vertigo and dizziness.

Anrep and his associates [173] found that khellin ("visamin") in 200 to 300 mg. doses given intramuscularly produces complete and prolonged relief in 41 of 45 patients with severe asthma. Three patients required a second injection. Relief was obtained in some asthmatic persons in whom both aminophylline and epinephrine had failed. No deaths occurred in the series, and side effects are described as few and mild. Relief obtained with khellin is not so prompt as that obtained with epinephrine.

A long series of experiments on the pharmacology and toxicology of dihydroergotamine (D.H.E. 45®) is reported by Orth and Ritchie.[174] They found that while 6 patients with migraine claimed better results with this drug than with ergotamine tartrate, twice the dose was required for a comparable effect. Dihydroergotamine prevented the occurrence of cardiac arrhythmias due to anesthesia in dogs and mon-

170. Waldbott, G. L.: The Antihistaminic Drugs, J. A. M. A. **135**:207-209 (Sept. 27) 1947.

171. Archibald, H. C.: Allergy in Childhood: Long Range View, Arch. Pediat. **64**:192-198, 1947.

172. Hartman, M. M.: Anti-Asthmatic Effects of a New Synthetic Antispasmodic: Beta-Diethylaminoethyl 9, 10-Dihydroanthracene-9-Carboxylate Hydrochloride, Ann. Allergy **5**:536-540, 1947.

173. Anrep, G. V.; Baroum, G. S.; Kenawy, M. R., and Misrahy, G.: Therapeutic Uses of Khellin, Lancet **1**:557-558, 1947.

174. Orth, O. S., and Ritchie, G.: A Pharmacological Evaluation of Dihydroergotamine Methanesulfonate (D.H.E. 45), J. Pharmacol. & Exper. Therap. **90**: 166-173, 1947.

keys. No oxytocic effects were noted, and the toxicity was found to be very low. Orth and Ritchie feel that the absence of side effects is responsible for most of the favorable impressions made by the drug.

Histamine azoprotein is discussed by Cohen and Friedman [175]; Hebald, Cooke and Downing,[20] and Dundy, Zohn and Chobot.[176] Cohen and Friedman found it useful in the treatment of urticaria and in certain cases of bronchial asthma but of no value in the prevention of hay fever when used alone. They state that to obtain maximum immunity six months of treatment with adequate amounts is required. Hebald, Cooke and Downing [20] found it of little value in the treatment of hay fever, and Dundy, Zohn and Chobot [176] report that it was generally ineffective in a series of 40 patients with various allergies. Cohen and Friedman [175] mention large local reactions and considered them harmless and to be expected.

Hansel [19] reports on a series of 750 patients, 150 of them children from 2 to 14 years of age, who were treated for nasal allergy and bronchial asthma with nethaphyl.® The report covers a seven year period. The effectiveness of the drug in relief of symptoms is described as most satisfactory and untoward side effects as inconspicuous. Doses and means of administration are discussed, and it is pointed out that repeated administration has not necessitated increases.

Hartman [177] discusses the relation of sex hormones to allergy and their use in the treatment of allergic disorders. He points out that allergies may begin or stop at either puberty or the menopause and that they may be related to the menstrual cycle. An otherwise satisfactory regimen of elimination and desensitization may be ineffective at this time. He feels that disturbed emotional balance is an important factor and that psychotherapy, together with antiallergic treatment, may be of value, until a hormone pattern can be established. In the group of menopausal women the uninhibited overactivity of the pituitary gland may be controlled by estrogens or, if bleeding is present, by androgens, and good results are claimed in 84 per cent of this group. Menstrual exacerbations of allergies were prevented in 83 per cent of cases by large, carefully timed premenstrual doses of estrogens, with methyltestosterone during the postovulatory or premenstrual phase, or by desensitization to estradiol, if necessary, to minimize the estrogen excess. The dangers of such treatment are discussed. The conditions

175. Cohen, M. B., and Friedman, H. J.: Histamine Azoprotein in the Treatment of Allergy, J. Allergy **18**:7-12, 1947.

176. Dundy, H. D.: Zohn, B., and Chobot, R.: Histamine Azoprotein: Clinical Evaluation, J. Allergy **18**:1-6, 1947.

177. Hartman, M. M.: The Use of Sex Hormones in Allergic Disorders, Ann. Allergy **5**:467-477, 1947.

treated included migraine, urticaria, asthma and perennial allergic rhinitis.

Goth and Holman [178] have found that large doses of a colloidal suspension of thorium dioxide (thorotrast®) protect dogs against anaphylactic shock, and they suggest that the liberation of histamine or heparin is prevented.

Frank [179] has found a snake venom preparation, crotalin, effective in protecting sensitized guinea pigs from fatal anaphylaxis in 63.1 per cent of cases. It did not prevent fatal anaphylaxis when given as a single dose a day before the shocking dose of antigen.

Sympathectomy as an antiallergic measure is discussed by Coca.[180]

EXPERIMENTAL INVESTIGATION OF ALLERGY

Squire and Lee [181] have demonstrated a reduction of approximately 43 per cent in the total number of white cells in the blood in patients sensitive to ragweed pollen on the addition of short ragweed antigen to heparinized blood in vitro. The polymorphonuclear leukocytes are said to be chiefly affected. In samples of blood heated to 50 C. for one hour, the ragweed-sensitizing antibody was inactivated and lysis did not occur. No significant evidence of lysis appeared in the untreated blood of ragweed-sensitive patients after adequate treatment with ragweed antigen.

Randolph [182] found that certain allergic persons exhibiting acute symptoms after trial ingestion of foods showed a decrease in eosinophils in the blood at the time of the reaction, followed by delayed eosinophilia as the symptoms subsided. Similar responses followed allergenic drugs in cases of known sensitivity. The reaction was best observed in acute responses of short duration and was more pronounced in some allergic persons than in others. It did not occur in normal or in allergic subjects on the administration of nonallergenic substances.

Rocha e Silva and his associates [183] have shown that the discharge of histamine and heparin by the isolated dog liver, following administra-

178. Goth, H., and Holman, J.: Effect of Thorotrast (Thorium Dioxide Preparation) on Anaphylactic Shock in Dog, J. Pharmacol. & Exper. Therap. **89**: 379-381, 1947.

179. Frank, D. E.: Use of Crotalin in the Prevention of Anaphylactic Shock in Guinea Pigs, Ann. Allergy **5**:156-159, 1947.

180. Coca, A. F.: Sympathectomy as an Antiallergic Measure, Ann. Allergy **5**:95-101, 1947.

181. Squire, T. L., and Lee, H. J.: Lysis in Vitro of Sensitized Leukocytes by Ragweed Antigen, J. Allergy **18**:156-163, 1947.

182. Randolph, T. G.: Blood Studies in Allergy: IV. Variations in Eosinophiles Following Test Feeding of Foods, J. Allergy **18**:199-211, 1947.

183. Rocha e Silva, M.; Scroggie, A. E.; Fidlar, E., and Jaques, L. B.: Liberation of Histamine and Heparin by Peptone from the Isolated Dog's Liver, Proc. Soc. Exper. Biol. & Med. **64**:141-146, 1947.

tion of peptone,, was markedly affected by the presence of blood in the perfusing fluid used. Only small amounts of histamine or heparin appeared in the perfusate when Tyrode's solution was used. These results are thought to suggest, but not prove, the participation of platelets, and perhaps leukocytes, in the mechanism of discharge of histamine and heparin from the liver.

Curry [184] reports on studies of the vital capacity of normal and allergic subjects given doses of 0.25 to 6 mg. of methacholine chloride U.S.P. (mecholyl chloride®) or 0.02 to 0.04 mg. of histamine phosphate parenterally. Three of 10 normal subjects had a slight reduction in vital capacity. Of 11 patients with hay fever, all had a reduction in vital capacity, and in 7 of them it amounted to 5 per cent or more. With histamine phosphate the reduction was 5 per cent or more in only 2 of them. Of 27 persons with asthma or a history of asthma all but 1 had a decrease of 5 per cent or more in vital capacity when methacholine chloride was used, and 22, a similar reduction with histamine. The indications are that methacholine chloride is a little more potent than histamine in the respective doses employed.

Swineford and Houlihan [185] were not successful in demonstrating a simple method of titrating the blocking antibody in the serum of ragweed-sensitive patients with pollinosis who had been treated. They could not confirm the report of Cohen and Weller [186] that precipitins could be demonstrated in the serums of treated ragweed-sensitive patients, but not in the serums of untreated patients.

Samter and Becker [187] found ragweed reagins in the nasal secretions of 7 of 10 ragweed-sensitive patients, while nasal secretions from normal subjects gave negative results.

Ross [188] demonstrated that whereas a subcutaneous injection of more than 12.5 mg. of purified egg albumin produced fatal anaphylaxis in guinea pigs, 27.5 mg. was required when given in solutions with 10 per cent polyvinyl alcohol and 50 mg. when given with protamine zinc in 10 per cent polyvinyl alcohol. He concludes that delayed absorption prevents the presence of a lethal dose at any one time.

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184. Curry, J. J.: Comparative Action of Acetyl-Beta-Methyl Choline and Histamine on the Respiratory Tract in Normals, Patients with Hay Fever, and Subjects with Bronchial Asthma, J. Clin. Investigation **26**:430-438, 1947.

185. Swineford, O., and Houlihan, R.: Antibodies to Ragweed Extract: Demonstration by Collodion Particle Technique in Immune Rabbit Serum but not in Serum of Treated Patients, J. Allergy **18**:190-195, 1947.

186. Cohen, M. B., and Weller, R. R.: Precipitins in the Sera of Patients with Clinical Allergy: Preliminary Report, J. Allergy **12**:242-243, 1941.

187. Samter, M., and Becker, E. L.: Ragweed Reagins in Nasal Secretion, Proc. Soc. Exper. Biol. & Med. **65**:140-141, 1947.

188. Ross, J. R.: Delayed Absorption of Proteins in the Guinea Pig, J. Allergy **18**:86-89, 1947.

MISCELLANEOUS ALLERGIES

Burden [189] discusses the problem of insulin allergy and its treatment. A case is reported in which treatment was successful with a modification of Urbach's method of skeptophylactic deallergization. An intradermal dose of 1:2,000 units of insulin was given three quarters of an hour before the required dose. This intradermal dose was determined on the basis of the production of a wheal about 15 mm. in diameter.

Tropical eosinophilia and Loeffler's syndrome and the relations between these conditions are discussed by Font,[190] who reports 2 cases, 1 of each disorder. Both patients were studied with the bronchoscope. The response of both the pulmonary lesion and the eosinophilia to treatment is thought to emphasize the relation of the condition to the offending organism, indicating a search for focal infection.

Alpher [191] reports 2 cases of Loeffler's syndrome, in 1 of which the condition was associated with hay fever while in the other recurrent features were presented.

Three cases of a condition diagnosed as allergic parotitis are reviewed by Waldbott and Shea.[192] The relation of swelling of the parotid gland to the onset of asthma is discussed. In 1 case the recurrent swelling preceded the asthma by many years, while in the other 2 cases the asthma preceded the swelling. Food sensitivities were shown to be the dominant cause of both the parotitis and the asthma. A brief review of the literature on allergic parotitis is presented. Another case of allergy of the salivary glands is reported by Johnston.[193]

In a review of his experience in the Philippines, Friedberg [194] points out the number of patients in whom allergies (hay fever and asthma) developed for the first time and the number who had had mild allergies and had become disabled by them. He was impressed by the frequency with which dermatitis, external otitis and allergic rhinitis, sinusitis or bronchitis occurred in the same person. The humidity and the tropical flora are thought to be the responsible factors.

189. Burden, S. S.: Treatment of Insulin Allergy with Report of a Case, Ann. Allergy **5**:209-218, 1947.

190. Font, J. H.: The Eosinophilic Lung, Ann. Otol., Rhin. & Laryng. **56**: 804-810, 1947.

191. Alpher, I. M.: Loeffler's Syndrome: Report of Two Cases, One with Recurrent Features and One Associated with Hay Fever, J. Allergy **18**:39-46, 1947.

192. Waldbott, G. L., and Shea, J. J.: Allergic Parotitis, J. Allergy **18**: 51-54, 1947.

193. Johnston, C. R. K.: Allergy of Salivary Glands: Case, Cleveland Clin. Quart. **14**:55-57, 1947.

194. Friedberg, S. A.: Otolaryngologic Experiences in the Philippines, Arch. Otolaryng. **45**:385-391 (April) 1947.

A symposium on allergy in the *American Journal of Medicine* included, among others, papers by Bohrod,[195] Cooke,[196] Kabat,[197] Rose,[198] Feinberg,[199] Sherman[200] and Rackemann.[201]

Of general reviews of allergy and allergic conditions may be mentioned those of Riley,[202] Piness,[203] Dimsdale,[204] Hartman[205] (the newer drugs), Claybon[206] (allergic headache), LePage[207] (asthma in children) and Williams[208] (relation of allergy to diseases of the eye, ear, nose and throat).

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195. Bohrod, M. G.: Classification of the Histologic Reactions in Allergic Diseases, Am. J. Med. **3**:511-522, 1947.

196. Cooke, R. A.: The Immunology of Allergic Disease, Am. J. Med. **3**: 523-534, 1947.

197. Kabat, E. A.: Quantitative Immunochemical Aspects of Some Allergic Reactions, Am. J. Med. **3**:535-544, 1947.

198. Rose, B.: Role of Histamine in Anaphylaxis and Allergy, Am. J. Med. **3**:545-559, 1947.

199. Feinberg, S. M.: The Antihistamine Drugs, Am. J. Med. **3**:560-570, 1947.

200. Sherman, W. B.: Drug Allergy, Am. J. Med. **3**:586-600, 1947.

201. Rackemann, F. M.: A Working Classification of Asthma, Am. J. Med. **3**:601-606, 1947.

202. Riley, B. M. B.: Present Position of Allergy, M. J. Australia **1**:270-272, 1947.

203. Piness, G.: What's New in Allergy? California Med. **67**:291-293, 1947.

204. Dimsdale, L. J.: Evaluation of Allergy in General Practice, J. Iowa M. Soc. **37**:114-117, 1947.

205. Hartman, M. M.: Newer Drugs for Allergic Disorders and Their Place in Histamine Theory, California Med. **66**:242-248, 1947.

206. Claybon, I. H.: Allergic Headache, Cincinnati J. Med. **28**:23-39, 1947.

207. LePage, C. P.: Modern Treatment and Preventive Measures for Asthma in Children, M. Press. **217**:386-389, 1947.

208. Williams, R. I.: Allergy as Related to Ear, Nose and Throat, Rocky Mountain M. J. **44**:37-39, 1947.

Abstracts from Current Literature

Ear

THE CLINICAL MANAGEMENT OF DEAFNESS. KENNETH M. DAY, Pennsylvania M. J. **52**:698 (April) 1949.

The article states that the earlier in childhood that pathologic changes of the middle ear, the eustachian tubes and the nasopharynx can be detected and corrected, the less trouble will be encountered in later life. It is essential that ventilation of the middle ears be maintained in infancy and childhood. Sclerotic mastoid processes usually result from improper treatment of chronic suppurative otitis media. Improper feeding in infancy is responsible for a major proportion of nonventilated middle ears. The infant should never be fed from a bottle while lying in a supine position, as swallowing may force fluids into the nasopharynx and a patent eustachian tube.

Secretion or fluid in the middle ear is a very common unrecognized condition in children. The cause may be swelling of the mucosa resulting from infection of the upper respiratory tract, entrance of foreign material in swallowing or vomiting, sudden changes of barometric pressure, congestive narrowing of the eustachian tubes, closing of the eustachian orifice by swollen lymphoid tissue, or adhesions around the mouth of the tube causing distortion. The symptoms are diminished hearing with a sense of stuffiness. The types are serous otitis and mucous otitis. The first is due to transudate blockage without inflammation. The drum shows a retracted drum membrane, a yellow cast and a fluid level; there is impairment of hearing for low tones.

The second, mucous otitis, is due to the exudation that occurs in inflammatory conditions. The drum membrane is not retracted but thickened and occasionally distended; it is opaque, shows no fluid level and is fixed on compression. There is impairment of the hearing of high tones, and the Rinne test is negative.

In local treatment inflation of the eustachian tubes usually relieves the serous type; under extreme circumstances, myringotomy may be performed, followed by inflation and suction. With the mucous type, myringotomy is necessary usually and may be followed by inflation and suction. Simple adenoidectomy is effective for the prevention of recurrences of serous otitis; for regeneration of adenoid tissue, irradiation is advised.

In dealing with the types of deafness due to nerve degeneration, it is important to differentiate in order to effect improvement. They are due to traumatic, toxic, vascular, allergic and central causes. Traumatic deafness may be due to continued and repeated exposure to high, intensive noises; the toxic type is due to infectious diseases, such as mumps, diphtheria, typhoid, influenza and syphilis and to drugs such as quinine, salicylates and streptomycin; nerve deafness due to vascular deficiency is found in arteriosclerosis, especially in that involving the anterior inferior cerebellar artery and its branches in cases of senile deafness, also in cases of hypotension and hypertension. Nerve deafness of the unilateral type may be allergic in origin or associated with true Ménière's disease.

Hearing aids are prescribed when there is a sufficient loss of hearing to prevent understanding of a normal conversational voice and when the hearing cannot be improved by medical or surgical means. Lip reading should also be advocated for children and young adults under these conditions. The hearing aids perform satis-

factorily for people with conduction or mixed types of deafness. Bone receivers are limited to cases in which the patient has little or no nerve involvement or in which there is a discharge and the practical application would be inhibitive of an air receiver. Hearing aids are not satisfactory for true nerve deafness when the loss is in the high frequencies.

It is important that otologists be frank and honest with patients who have hearing losses, so that these patients will have faith in them and try to comprehend their own condition.

LANDIS, Reading, Pa.

INFLUENCE OF SULFONAMIDE DRUGS ON LABYRINTHITIS AND ON INDICATIONS FOR OPERATIVE INTERVENTIONS IN THE INNER EAR. VLADIMÍR HLAVÁČEK, Acta oto-laryng. **35**:258 (May-June) 1947.

The observations of Hlavácek indicate that in cases of labyrinthitis complicating acute otitis it is possible by employing intensive treatment with sulfonamide drugs to defer operation on the inner ear, even though the increase of cells in the spinal fluid is such that in the days before the use of sulfonamide drugs labyrinthectomy would have been indicated.

The author observed 7 cases of acute labyrinthitis complicating acute otitis media. In all these cases intensive treatment with sulfonamide drugs was instituted, with only paracentesis or antrotomy as an operative procedure. Although an increase in the cells of the spinal fluid was present, the operation on the inner ear was postponed, even when as many as 208 cells were encountered. In 6 of these cases a cure was achieved without an operation on the labyrinth, and in 1 case a labyrinthectomy was performed. In all cases recovery followed.

In 5 cases of labyrinthitis occurring during the course of chronic otitis media the same sulfonamide treatment was instituted at the beginning of the meningitis as in cases in which an abolition of the function of the inner ear was present. In all cases an increase in the number of cells in the spinal fluid occurred in spite of intensive sulfonamide treatment, so that labyrinthectomy was necessary. Therefore, the sulfonamide therapy did not influence the course of otitis interna occurring in the course of chronic otitis media.

GROVE, Milwaukee.

STUDIES ON THE STABILITY OF MAN. L. B. W. JONGHEES and J. J. GROEN, Acta oto-laryng. **35**:327 (July 31) 1947.

In this article an interesting mechanical and physical study of the stability of man is represented. The authors test the ability of the human organism to resist sudden changes in position. The testing is done with an apparatus in which a small car riding on rails can be given any desired acceleration. After the acceleration it carries with it a constant speed until it is braked; the accelerations are accurately measured.

The average results in a series of 50 volunteers were as follows: The authors found that acceleration in a forward direction can be up to 76.75 cm. per second per second, in a backward direction up to 48 cm. per second per second and laterally up to 33 cm. per second per second when the subjects stand erect with the eyes closed and the feet together. The authors have developed an index to express steadfastness. This is expressed by the proportion between the acceleration and the normal figure for the three principal directions put together.

The stability of the human body is determined by the labyrinth. With normal labyrinthine response the stability within the limits of the muscular strength of the person corresponds somewhat to that of a statue of corresponding shape.

ROBERT LEWY, Chicago.

Larynx

NEW TECHNIC FOR THE TREATMENT OF THE DILATOR PARALYSIS. GEORGES PERELLO, Rev. de laryng. **70**:80 (Jan.-Feb.) 1949.

The surgical procedure recommended is as follows:

1. A horizontal incision of skin and fascia is made over the median part of an ala thyroid of the cartilage, from the sternocleidomastoid muscle to a point 1 cm. on the opposite side.

2. The omohyoid muscle is retracted, and the sternohyoid muscle is incised and retracted. The thyroid gland is retracted down if necessary.

3. The sternothyroid muscle is sectioned and elevated, covering the thyroid cartilage (an ala). The muscle is then resected 0.5 cm. at its upper end.

4. A horizontal longitudinal window is opened in the thyroid cartilage with a sharp scalpel or a circular saw; its internal perichondrium is removed and the thyroarytenoid muscle is thus visualized. Its inner bundle forms the true vocal cord.

5. The latter muscle is then removed in a depth of 2 mm., and its inner bundle is sutured to the upper end of the sternothyroid muscle with no. 2 catgut.

6. The sternohyoid muscle is sutured, and the wound is closed by successive planes.

The author insists that, in order to avoid entrance into the pharynx, the fenestra of the thyroid ala should be situated in the latter's anterior inferior quadrant.

The sternothyroid muscle, contracting itself during inspiration, will carry the vocal cord outside the fenestra, and the shortening of the muscle surgically as mentioned, will help markedly the abduction of the cord. This operation appears to the author to be more rapid and simpler than most of the procedures recommended and does not open the pharynx or the larynx. The voice is conserved.

HERSON, Chicago.

Nose

TREATMENT OF CHRONIC NASAL DIPHTHERIA CARRIERS: REPORT OF CASE. JOSEPH X. MEDWICK and OLAV E. HALLBERG, Ann. Otol., Rhin. & Laryng. **57**:135 (March) 1948.

The finding of a fetid, irritating unilateral or bilateral discharge from the nose causing excoriation and swelling of the alae nasi and upper lip should suggest the presence of diphtheria organisms. Since all strains of the diphtheria organism are not pathogenic, it is necessary to test the virulence of the culture obtained. There is considerable evidence that a patient may acquire a virulent strain and carry it in the nose indefinitely without clinical evidence of toxic effects, a condition ascribed to autoimmunization. The virulence of the organisms in the nose may become attenuated so that they are harmless, but at some future time they may again become virulent, owing either to local trauma or to infection with other bacterial forms. Treatment of nasal diphtheria carriers with antiseptic nose and throat sprays and by painting the throat with solutions of iodine or formaldehyde has not been satisfactory. Diphtheria antitoxins have given little success, probably because they exert no direct action on the organisms themselves. Tonsillectomy and adenoidectomy combined with use of sprays of an antiseptic solution or chemotherapeutic agents frequently have proved useful. Roentgen radiation, sulfonamide drugs and penicillin are usually effective in the treatment of chronic nasal diphtheria carriers. However, the presence of chronic sinusitis in a nasal diphtheria carrier is an indication for surgical treatment combined with chemotherapy. Despite the infrequency of the occurrence of diphtheria organisms among

nonimmunized patients who have a chronic nasal infection, material from the nose should be cultured for these organisms. Cured carriers should be checked periodically, especially after severe infections of the upper respiratory tract.

MILLER, Philadelphia.

THE ROLE OF THE RHINOLOGIST IN RHINOPLASTY. SAMUEL SALINGER, Laryngoscope **58**:720 (July) 1948.

Salinger presents convincing reasons that rhinoplasty should be included in the field of rhinology. Not only is the rhinologist the logical person to perform such work, but also he is being gradually deprived of much of the work he formerly did: sinus and mastoid operations, bronchoscopy and even tonsillectomies. To do competent rhinoplasty, however, is not easy; the candidate must be able and adept, and his training thorough.

HITSCHLER, Philadelphia.

RATIONALE FOR REMOVAL OF EVERY VESTIGE OF DEVIATED NASAL SEPTUM. E. MARKEY PULLEN, Laryngoscope **58**:1055 (Sept.) 1948.

Pullen presents arguments to show that a total removal of deviated septal bone and cartilage is desirable. It has been thought that a rim of cartilage and bone should be left as a support. This is not true. The septum itself under static conditions does not support the nasal ridge or tip. Deformities occurring after a submucous resection are not due to lack of support but, rather, to cicatricial contractions of the area of operation. Operative procedures to prevent these contractions are presented and anatomic, physiologic, mechanical and clinical considerations discussed.

HITSCHLER, Philadelphia.

THE REMOVAL OF SECRETIONS FROM THE NASAL ANTRUM: THE PART PLAYED BY PRESSURE WHEN IRRIGATING THE NASAL PASSAGE WITH WARM SALINE SOLUTION; A PHYSICAL HYPOTHESIS. J. J. CANTOR, Laryngoscope **57**:1307 (Dec.) 1948.

Cantor attempts to prove theoretically how secretions are removed from a sinus by irrigation of the nasal cavity. He shows that their removal is due to the warming and hence expansion of the air in the sinus, which forces the secretions out, rather than by the sucking effect of the fluid passing by the sinus ostium. If the air is allowed to cool, repetition of the procedure will remove further secretions. He suggests that the procedure be called "the interrupted replacement method."

HITSCHLER, Philadelphia.

Miscellaneous

TWENTY-FIVE YEARS OF CLEFT PALATE PROSTHESIS. CLOYD S. HARKINS and HERBERT KOEPP BAKER, J. Speech & Hearing Disorders **13**:23 (March) 1948.

Great advances have been made in the development of speech aids constructed for functional improvement in cases of cleft palate. The fixed bulb type of instrument is now generally conceded to be the most satisfactory in most cases. The size and shape of the bulb and the palatal extension are highly individualistic. A surgical redivision sometimes needs to be done for proper positioning of the bulb appliance in the pharynx. A number of clinics have shown that with the combined services of the pediatrician, surgeon, prosthodontist, orthodontist, general dentist, speech correctionist and psychologist-educator, the total needs of the child can best be evaluated and served. The examinations should be made concurrently with

opportunity for extensive interconsultation. Time has shown that the use of certain materials and technics can keep the cost of cleft palate prosthesis well within the economic limits which enable children and adults who require it to be provided with the apparatus.

PALMER, Wichita, Kan.

STUDIES IN CLINICAL TECHNIQUES: III. MANDIBULAR FACET SLIP IN CEREBRAL PALSY. MARTIN F. PALMER, J. Speech & Hearing Disorders **13**:44 (March) 1948.

In this article, attention is called to a serious deformity existing in cases of cerebral palsy, particularly tension athetosis and spastic paralysis, in which the mandibular condyle slips from the hinged joint, resulting in a cumbersome, slow and unprecise mode of speech. Correction of the speech disorders found in cases of cerebral palsy cannot be adequate without reduction of this abnormality. Technics are outlined as used by the Institute of Logopedics for the reduction of slipping of the mandibular facet during the acts of chewing, sucking, swallowing and speech.

PALMER, Wichita, Kan.

SPEECH SURVEY METHODS IN PUBLIC SCHOOLS. VANETTA R. SUYDAM, J. Speech & Hearing Disorders **13**:51 (March) 1948.

The author enumerates four principal methods of locating children in need of speech training now used by speech clinicians. The first is the referral method, in which classroom teachers, principals, parents and others refer to the correctionist those children needing remedial speech work; the second is the speech survey; the third is a combination of the referral and the survey method, and the fourth is voluntary enrolment by the students themselves. The speech survey generally consists of a questionnaire, a personal interview or a combination of the two. A study of survey methods used in this country shows that a child needs to be surveyed only once. Teachers should notify correctionists of children who need retesting. If each child is given a sweep test, after which doubtful subjects are retested, the results are more reliable. Methods used in speech surveys should be adapted to the needs of the individual clinician, the children tested, the community and the situation. The speech survey is an essential part of the speech correctionist's work.

PALMER, Wichita, Kan.

CLINICAL MANIFESTATIONS OF HODGKIN'S DISEASE. JOHN H. TALBOTT, New York State J. Med. **47**:1883 (Sept. 1) 1947.

This report grew out of a study of 6 patients with Hodgkin's disease who were seen at the Buffalo General Hospital or in the clinics of the University of Buffalo School of Medicine. Of interest to the ear, nose and throat specialist is the fact that in each instance the cervical nodes were involved. The general symptoms and signs were generalized lymphadenopathy, roentgenographic evidence of hilar and mediastinal hypertrophy, cutaneous manifestations, fever, weakness, malaise, loss of weight and cervical adenopathy. Radiation therapy was given in every instance, and for some nitrogen mustard (methyl-tris-[2-chloroethyl] amine hydrochloride) was also used, but with the observation that it was chiefly of negative value.

Early diagnosis is not made in many cases. Since biopsy is the chief factor in diagnosis of this disease, it is urged that in any case in which observable enlargement of lymph nodes persists or continues, biopsy of the node be done. Furthermore, a clinical diagnosis of Hodgkin's disease should not be made without biopsy.

The cervical or axillary nodes are to be preferred to the inguinal nodes for biopsy. Since radiation may alter the pathologic appearance of lymph nodes, its use should be withheld in most instances until after biopsy.

VOORHEES, New York.

DIAGNOSIS OF BRAIN TUMORS IN CHILDREN. TRACY J. PUTNAM, Am. J. Dis. Child. **75**:721 (May) 1948.

Tumors of the brain are rarer in children than in adults but are among the commonest tumors in the very young. They are expanding lesions, so that headaches caused by the pressure are early and should arouse suspicion, since children rarely have headaches from common causes. Vomiting is not necessarily projectile, and a full meal may be eaten with relish after an attack. Bulging of the fontanels and separation of sutures are common cranial findings. Choked disk comes later than in adults, but paralysis of the sixth nerve occurs from expansion of the nerve as it passes through the incisura. A slow, relentless progression of symptoms is common. The head is carried to one side, and attempts to move it are met with great pain and cervical spasm. Special diagnostic methods are electroencephalography, lumbar puncture, and encephalography and ventriculography combined. Stereoscopic roentgen ray studies are valuable. In the majority of cases the tumor is in the posterior fossa with symptoms familiar to the otolaryngologist. Cushing was among the first in the United States to describe "Intracranial Tumors of Preadolescence" (*Am. J. Dis. Child.* **33**:551 [April] 1927). The literature on this subject seems to be limited in amount. Very few of such brain tumors are operable, and the prognosis is unfavorable.

VOORHEES, New York.

VITAMINS IN OTOLARYNGOLOGY. P. E. HENNEBERT and J. CHALMAGNE, Acta oto-rhino-laryng. belg. **2**:103, 1948.

The writers review the cause and circumstances of appearance of vitamin deficiencies, as well as the action of vitamins and state that their use in otolaryngology is as yet on an empiric basis. Successful vitamin therapy has been established for only a few conditions: (1) ascorbic acid and vitamin K for hemorrhagic states, (2) pyridoxine (vitamin B_6) for auditory neuritis, vertigo and Ménière's disease and (3) nicotinic acid amide (P-P factor), vitamin M (yeast and liver extract essential for nutritional and hematopoietic equilibrium in monkeys) and vitamin B complex for pellagra and oral and pharyngeal lesions.

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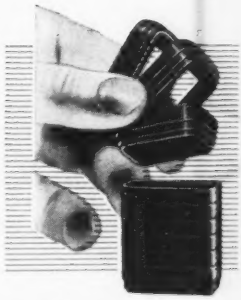

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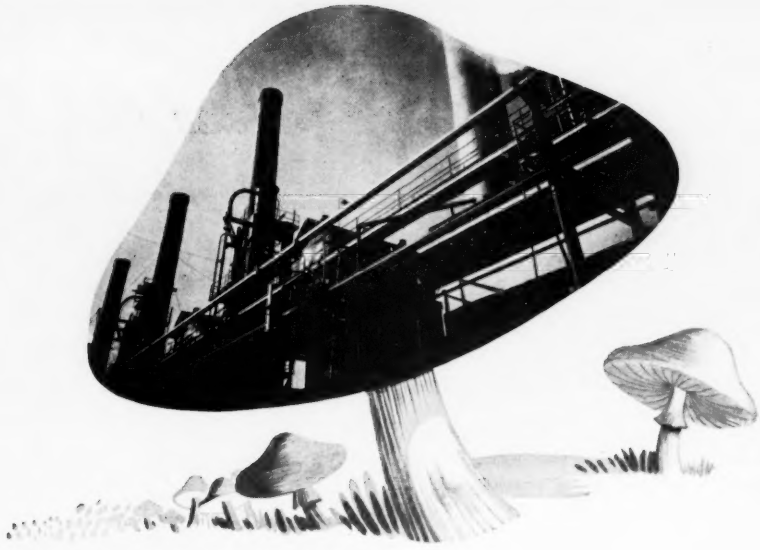

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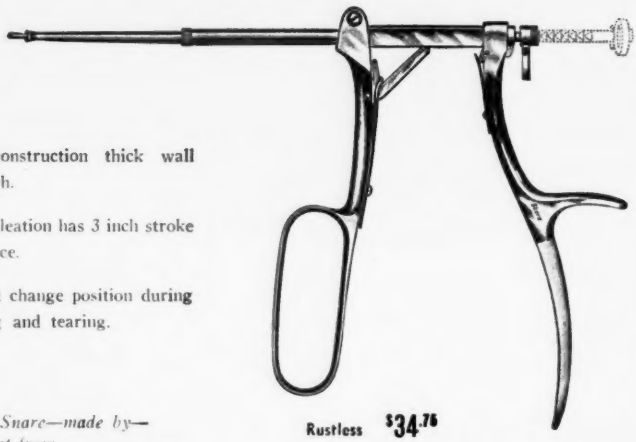

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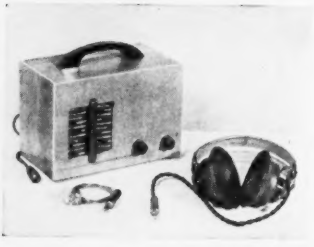

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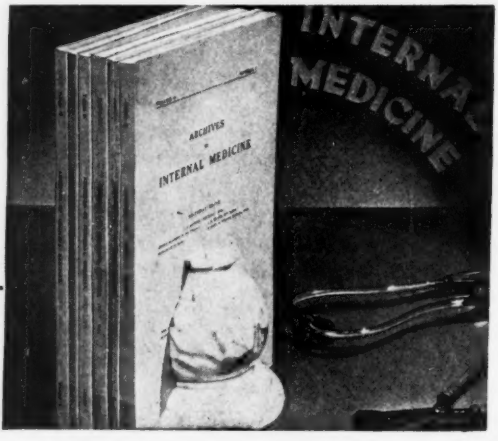

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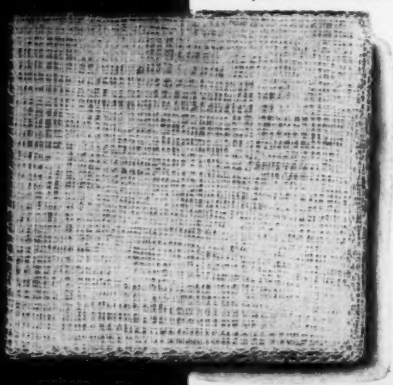

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CONTENTS

PAGE

Surgery at the Base of the Tongue by Transpharyngeal Approach. Professor Georges Portmann, Bordeaux, France 373

Perilymph: Its Relation to the Improvement of Hearing Which Follows Fenestration of the Vestibular Labyrinth in Clinical Otosclerosis. Julius Lempert, M.D., New York; Ernest Glen Wever, Ph.D., and Merle Lawrence, Ph.D., Princeton, N. J., and Philip E. Meltzer, M.D., Boston 377

Some Suggestions for Speech Reception Testing. J. Donald Harris, Ph.D., New London, Conn 388

Virus Vaccine Immunization Against the Common Cold. Noah Fox, M.D., and George S. Livingston, M.D., Chicago 406

Use of Radium in Treatment of Hypertrophic Lymphoid Tissue in the Nasopharynx. Charles H. Dow, M.D., Monessen, Pa 417

Abscess of the Cerebellar Lobe of Otogenic Origin: Combined Otolaryngologic and Neurosurgical Treatment in Six Cases. Joseph X. Medwick, M.D.; Alfred Uihlein, M.D., and Olav E. Hallberg, M.D., Rochester, Minn 429

Tinnitus Aurium in Otosclerosis. Maurice Saltzman, M.D., and Matthew S. Ersner, M.D., Philadelphia 440

CASE REPORTS:

Rhinophyma. Richard H. Wehr, M.D., Syracuse, N. Y 443

Abscess of the Brain Following Tonsillectomy and Adenoidectomy. Samuel A. Alexander, M.D., and Royal Reynolds, M.D., Washington, D. C 450

Osteoma of the Tongue. Ira S. Witchell, M.D., New York 453

Cicatricial Stenosis of the Hypopharynx Treated with Skin Graft. Robert B. Robertson, M.D., Boston 457

Recurring Mastoiditis, Meningitis and Abscess of Right Temporosphenoid Lobe. Benjamin H. Shuster, M.D., and Meyer A. Marks, M.D., Philadelphia 462

PROGRESS IN OTOLARYNGOLOGY. Summary of the Bibliographic Material Available in the Field of Otolaryngology:

Review of Allergy for 1947. E. L. MacQuiddy, M.D., and E. A. Holyoke, M.D., Omaha 466

ABSTRACTS FROM CURRENT LITERATURE 506

DIRECTORY OF OTOLARYNGOLOGIC SOCIETIES 512